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The next Annual Meeting of the Massachusetts Medical Society will be held at the Hotel Statler, Boston, on Wednesday, Thursday and Friday, June 8, 9, and 10, 1932.

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The Massachusetts Medical Society

THE STORY OF SMALLPOX IN MASSACHUSETTS*

BY SAMUEL BAYARD WOODWARD, M.D.†

Mr. President and Fellow Members:

IT is a great honor to be asked to stand here as the one hundred and twenty-seventh annual orator of this Society.

Greatly handicapped by the fact that I immediately follow that distinguished writer, orator and surgeon, Dr. Harvey Cushing, it occurs to me that instead of wandering in fields where my somewhat senile mind might easily lead me astray, I had better confine myself to something that I do know a little about and consequently, and I hope not too lengthily, I propose to tell you the story of smallpox in Massachusetts.

It was in Massachusetts that inoculation for smallpox was first tried out on this side of the Atlantic.

Massachusetts was the first state in the Union in which vaccination against smallpox was performed.

The first medical publication in this country was a broadside on the treatment of smallpox published in Boston.

The first state compulsory law for the vaccination of school children was passed by a Massachusetts Legislature.

In proportion to its population, in no state in the Union has less smallpox been of late years annually reported. That this comparative immunity has been attained, despite the fact that the United States as a whole suffers more today from smallpox than any country in the world, bar India, China and possibly Russia, speaks well for its health officers both state and local.

Massachusetts probably knew smallpox before the Mayflower crossed the sea, for when as the Historian Baylies puts it, "on the bleak shores of a barren wilderness with the blasts of winter howling around them, the Pilgrims of Leyden laid at Plymouth the foundations of American liberty", it is more than probable that to the recent extermination of the previous inhabitants by an epidemic that may well have been smallpox those who survived that first winter owed their preservation. Seven years earlier the Narragansetts alone were said to be able to muster some 3,000 warriors and had but a tithe of that number put in an appearance to repel the invaders, not all the bravery and strategy of Miles Standish and his men could have saved the half-starved remnant of that little band. The attempt to found a settlement at Plymouth would have failed as did the similar effort at Jamestown in 1607. That some terrible calamity had destroyed the inhabitants of Plymouth and the surrounding country is an undoubted fact. The Pilgrims settled in no unknown territory. Whether or no the Norsemen rounding Cape Cod named it Kjarlarnes or buried one of their leaders on the Gurnet at the entrance of Plymouth harbor, whether or no Sebastian Cabot sailed thus far to the south, it is undoubtedly true that the Gosnold Expedition in 1602 gave the name "Cod" to the cape of fishes, that in 1603 the ships of three nations, England, France and Holland, visited the site, that the men with Captain Pring went ashore there and even erected a barricade of logs, and it is more than suspected that here was the Occomock where Capt. John Smith fought with the Indians in 1614. In 1619 Capt. Thomas Derner found "some ancient plantations not long since populous, now utterly void, a remnant remaining but not free of sickness". What was this sickness? For many years ships from Europe had been present in North American waters. Since the discovery of the Hudson by Verrazano in 1524, the French had constantly sailed up that river to trade with the Indians. As early as 1527 there were at St. Johns at one time 14 sail of Normans, British and Portuguese, and 75 years later France, Spain and England had engaged in fishing off that northern coast no less than 450 vessels. In 1609 Champlain was leading his Algonquins against the Iroquois on the lake bearing his name. In 1613 Adrian Block was at New Amsterdam and the next year exploring Long Island Sound. In 1615 a trading post was established where Albany now stands. It seems impossible that, with the then universal prevalence of smallpox, cases were not constantly occurring on these vessels and among these adven-

*The Annual Discourse delivered before the Massachusetts Medical Society at the one hundred and fifty-first reunion, held in Boston, June 8 to 10, 1932.

†Woodward—President, Massachusetts Medical Society, 1916-1919. For record and address of author see "This Week's Issue," page 1221.

turers. It also seems unlikely, contact with the Indians being close (some thirty of them in one instance being taken to Portugal and sold as slaves) that, in the course of time, the disease was not communicated to the aborigines.

Samoset, the Wampanoag, with his, "Welcome, Englishmen", and his invitation to "take the soil", had learned the language from those who came as far south as the Penobscot.

Miles Standish in 1620 found, as did Derner the year before, but "a few straggling inhabitants, burial places, empty wigwams and some skeletons" and whether it came from the ships or spread to New England from the distant south into which it had been brought by Pizarro and Cortez one hundred years before, I submit that neither malaria, nor yellow fever, nor the plague, but smallpox was the blessing in disguise that gave our emigrant ancestors an opportunity to found the state.

Be all this as it may, it was not long before the settlers began their own battle with smallpox. The fight is not yet over, perhaps never will be, although what is happening in our time is but a skirmish against outposts compared with the contest waged by our predecessors. The opposition to our present laws and their improvement would seem but the blowing of a summer zephyr to those who endured the hurricane of abuse hurled against the advocates of inoculation in 1721 and of vaccination in 1800.

For 180 years smallpox was responsible for more deaths than any other one cause. Almost always sporadically present, coming in epidemic form every few years, few indeed escaped its ravages.

There were deaths from it in Boston within a year of its settlement in 1630.

In 1633 it swept away almost every native as far north as the Piscataqua and destroyed some 300 Narragansetts to the south.

In 1636 the General Court moved to Cambridge and later to Roxbury to escape the disease then raging in Boston.

In 1638 Winthrop says that "two ships came in much 'pestered', lost many passengers and some principal men", that, "many fell sick after they landed and again many of these died and many inhabitants with them".

Capt. John Bonner speaks of an epidemic in 1640 and there was certainly an outbreak in 1649.

In 1659 the General Court sat at Charlestown on account of the spread of the smallpox in Boston.

In 1666 forty died of the disease.

In 1668 a fast was appointed on account of its prevalence and the election sermon with its title of "Nehemiah on the Wall in Troublous Times" opened with the declaration that—"The still outstretching hand of God's powerful wrath over this poor country, smiting down our pillars, plucking up our stakes and taking from us the breath of our nostrils is a matter so doleful, solemnly awful and tremendous that one may well sigh out our sorrows in the words of the lamenting church, Lamentations 5:16:17, 'The crown is fallen from our head: Woe unto us that we have sinned! For this our heart is faint; For these things our eyes are dim.'"

In the winter of 1677-78 smallpox again raged, brought as usual by English ships, and many deaths were recorded. Fast days were held to stay its progress, but the first of Trousseau's three epochs of smallpox was at hand, the other two being of course inoculation with and vaccination against it.

Sydenham, the English Hippocrates, was now to immortalize himself by overturning the practise of centuries in the treatment of fevers and of smallpox in particular. Early in 1666 he published his "Methodus Curandi Febres" treating of the continued, pestilential, intermittent and epidemic forms. A second edition appeared in 1668 and a third much enlarged with a section particularly devoted to smallpox in 1676. No longer was the unfortunate victim to be kept in "a chamber close shut, if it be winter the air to be corrected by large fires", care taken that "no cold air" got to his bed, where he lay covered with blankets, his linen never shifted till after the fourteenth day for fear of "striking in the pock to his irrevocable ruin"; he comforted the while by the assurance of the authority Diemerbröck that "it is far better to let the patient bear the stench than thus to be the cause of his own death". For all this was to be substituted as Sydenham's influence spread, despite the abuse of his contemporaries, rest in bed, plenty of air, moderate heat, and light but sufficient covering, cool drinks, and marked dependence on the Vis Medicinae Naturae with a following on the physician's part of the Hippocratic practice of watching and aiding the natural crises instead of trying by active and intrusive measures to force the issue. With but little delay the proposed change in treatment was brought to the attention of the people of Massachusetts, for on January 21, 1677 there appeared as a broadside—

"A Brief Rule
To Guide the Common People of New England
How to Order Themselves and Theirs in the
Smallpocks or Measles

This was printed by John Foster of Boston and signed by Thomas Thatcher, the first minister of the Old South Church. Smallpox was then again present in epidemic form for the ninth time in 47 years. Without question Thatcher was familiar with Sydenham's publication of the previous year. The use of words and the construction of sentences betray the broadside's origin. We are told of the "boyling of the

blood by which nature thrusts out the impurities from veins to flesh and from flesh to skin" and are warned of "the danger of overhastening or overdelaying this process either by too many clothes, too hot rooms, cordials like Diascordium, Gascon's powder and such like, or by preposterous cooling by bloodletting, glysters, vomits, purges or cooling medicines, lest by the first treatment come phrenzies, dangerous sweats or flowing of the pocks together, or by the latter means there be raked away that supply of blood which should keep them out until they are ripe." "Let him drink," says Thatcher, "small beer warmed with a 'tost', sup up water gruel made with indian-flour not with oatmeal: let him eat boiled apples but (and mark the words) I would not advise any medicines. But if his blood be enraged that it will admit of no delay, bleed him. These things have I written", he continues, "not to inform the learned physicians that have much more cause to understand all that pertains to the disease than I, but to give some light to those that have not such advantages. I am though no physician but a well-wisher to the sick and therefore entreating the Lord to turn our hearts and stay His hand."

"I am
A Friend, Reader,
to thy Welfare.
Thomas Thatcher."

Despite his disclaimer Thatcher was, as Dr. Viets has pointed out, one of the outstanding preacher physicians of the time. He had studied with Charles Chauncy, later the second President of Harvard College, who also combined the care of bodies with that of souls and he himself died the next year following a visit to a sick person. This combination of medicine and theology was as common in the mother country as on this side of the Atlantic and had existed from very early times. Medicine was not a distinct profession but was practised by the clergy, even by those holding exalted positions. The Bishop of Worcester was for example the physician to Richard the II. Physician or no, Thomas Thatcher by his publication paved the way for a more humane treatment of smallpox in the Colony and Sydenham's methods became known here through his broadside almost as soon as they attracted any marked attention in the mother country. Though the treatment became more humane, though lives were undoubtedly saved, the ravages of smallpox ceased not at all.

In 1690 the disease which had prevailed in Boston before the departure of Sir William Phips' ill-fated expedition against Canada spread through the fleet and many died both during the advance and the retreat, while many more perished on shore after its return. Public fasts were decried in March and in July but it was not until February 23, 1692-3 that a thanksgiving was held for the cessation of the scourge.

In 1697 smallpox again held sway, carrying off in that and the succeeding year some ten hundred of the then seven or eight thousand inhabitants of Boston. Visualize, if you can, what the death of 250,000 of the 2,000,000 people in Metropolitan Boston of one disease in one year would mean to us, and you picture what our ancestors endured during those twelve months with what courage they might. Three years later, in 1700, Mr. Leverett writes that Judge Sewall came from Cambridge to open the Court in the Meeting House, "because the Town House is very near a house that has the smallpox and people are afraid to go there". May I add, as well they might be?

In 1701 the first smallpox prevention act authorized the impressment of houses for the isolation of patients.

In 1702 three hundred died, the tolling of bells at funerals was limited, "there to be only a first and a second tolling, each bell not to exceed the space of half of one quarter of an hour" and it was suggested that there be moderation in the price of coffins, digging of graves and wages of porters to carry the corpse, but the unhappy constable was still required to fulfill that duty of his office which compelled him "to attend the funerals of those dying of the smallpox" and to walk before the corpse to give notice to "any y't may be in danger of ye infection".

And then for 19 years Massachusetts was practically free from the disease, by far the longest period of immunity since the landing at Plymouth. A whole generation that knew it not had grown up when in 1721 in the midst of the most terrible outbreak up to that time recorded inoculation was introduced.

The first hundred years had come and gone. Twelve times present in epidemic form, sporadic cases always cropping up, the only escape flight and that too rarely a successful expedient, smallpox during this century had done more to hinder the growth of the Colony than Indian raids, foreign wars or any other general calamity.

A letter describing inoculation as practised in Turkey sent to Dr. John Woodward of London in 1713 by Dr. Emanuel Timonius Alspeck of Constantinople and a second letter from Pylarinus, a Venetian physician on the same subject were published in the *Philosophical Transactions* of the Royal Society in 1714 and 1715. Little attention seems to have been paid to these publications in England. It was not so when they reached America, as will be seen in the sequel. Lady Mary Wortley Montagu, wife of the English Ambassador to Turkey, described the practise in a letter to a friend in

1716, had her son inoculated soon afterwards, and in 1718 returned to England determined to do what she could to bring what she calls "this useful convention" into fashion. She later protested that for four or five years after her return she scarcely passed a day without repenting her audacity. If she followed up what she wrote to her friend in 1716, she told all and sundry that smallpox so fatal in England was entirely harmless in Turkey, that old women operated every autumn on parties of people who decided to have the disease together (these parties were common in New England later in the century), that patients were rarely in bed more than 2 or 3 days, never had more than 20 or 30 pocks on their faces and no scars, and that there was no example of one who had died of it, but it was not until April 1721, three years after her return to her home, that under the protection of the Princess of Wales, later Queen Charlotte, she arranged the first inoculation in England that of her own child, little Mary Alice. Clamor rose beyond belief. The clergy thundered from the pulpit on the impiety of thus seeking to take events out of the hands of the Almighty, Edmund Massy of St. Albans, for example, preaching against sinfully endeavoring to alter the course of nature by presumptuous interposition which he would leave to the atheist, the scoffer, the heathen and the unbeliever, and concluding that Satan was the first inoculator quoted Job 2:7, "So went Satan forth from the presence of the Lord and smote Job with sore boils from the sole of his foot unto his crown." The common people hooted at Lady Mary in the streets as an unnatural mother; "Four great physicians were", she says in her memoirs, "deputed to watch the progress of the experiment with an evident unwillingness to have it succeed, manifesting such a spirit of rancour and malignity that I never dared to leave the child with them for one second lest it should in some secret way suffer from their interference." Her opinion of the English medical profession was not exalted for she "would have written from Turkey to some of them", as she puts it, "if I knew any that I thought had virtue enough to destroy such a considerable branch of their revenue for the good of mankind."

Remembering the high mortality of smallpox, responsible as it was for 1/10 at least of all deaths, one cannot perhaps wonder at the feeling exhibited against one who was deliberately and in the popular opinion unnecessarily aiding in its spread.

When, however, we realize that inoculation had been practised in India from time immemorial and in China for hundreds of years where inoculation in the nostrils was the usual practise—the right side being used for males, the left for females—it does seem rather remarkable that it was unknown in England and indeed in Europe generally 40 years after it had been practised in Turkey and it comes to us with rather of a shock to read in the court records of 1710, but 11 years before Lady Mary's experiment, that one, Thomas Hawkins, "was paid 8d. for whipping two people who had ye smallpox", whether as a cure or a punishment does not appear.

The Royal Society's publications containing the Timonius & Pylarinus letters were brought to Boston in 1718 by the Scotch physician, William Douglas, who had studied medicine in Paris and London and was to be for many years the only graduate in medicine in the Colony. These publications he, a man of ability and intelligence and a masterful writer but tactless, with strong prejudices and a craving for notoriety and as someone said of him "always positive and sometimes accurate", lent, probably early in 1721, to one whom in a letter to a friend he calls "a vain, credulous preacher". This preacher was the famous Cotton Mather, himself an occasional contributor to the Transactions, who to the indignation of Dr. Douglas almost at once made use of them.

While little Lady Mary still lay ill in London, the British fleet from the Barbados brought smallpox again to Boston where it spread, even for those times, with unexampled rapidity. Before it subsided, a year later, 5,759 of the 12,000 inhabitants of Boston had been stricken, 844 of whom died, while the surrounding towns and very likely those more distant were in equally bad case. Roxbury, Cambridge and Charlestown were particularly affected, 100 dying in the latter small settlement alone, and so many were ill that by Christmas the selectmen ordered that the sexton do not on any account whatsoever, without an order from them, toll above three bells in one day for the burial of any person, lest it be a discouragement to those that were ill with the smallpox. The prosperity if not the very existence of the Colony was most seriously threatened. Mather fresh from his reading and mindful of the fact that in 1702 several of his children were desperately ill of the disease wasted no time. On the fourteenth of May the selectmen instructed by the freeholders had waited on the Governor with the request that the pest-ridden ship Seahorse be sent down to Governors Island. On the twenty-sixth Mather wrote in his diary, "The practise of conveying smallpox by inoculation has never been used in our nation, but how many lives might be saved by it if it were practised: I will procure a consult of physicians and lay the matter before them." On the sixth of June he issued an address calling the attention of the physicians to the new method embodying in it the two letters from the Transactions previously referred to. He requested them to meet and consult whether inoculation should be tried in the emergency then present. The immediate

result of this address was the demand of Douglas for the return of his pamphlets and his refusal to again lend them for use or comparison, but its perusal pleased Dr. Zabdiel Boylston, a practitioner of the town and as he later says in his account of what happened, "I resolved in my own mind to try the experiment, well remembering the destruction the smallpox made in Boston 19 years before and how narrowly I escaped with my life. It may make a strange figure in New England especially when one or two have made the discovery how the practise could produce the plague. As they also say that Mather did not make a fair transcribe of the observations from the Levant, I prayed that they might be read but Dr. Douglas, who owned them, refused to allow this."

It is perhaps no wonder that medical men in general paid little attention to Mather's letter. He inextricably mixed piety and medicine in many of his publications, thought disease the result of sin, sickness Flagellum Dei pro peccato Mundi, advised the scattering of wens by the laying on of a dead hand and eulogized the healing virtues of a solution of sowbugs. He believed in witch marks and the application of the water ordeal which, as Oliver Wendell Holmes puts it, means "Throw your grandmother into the water, if she has a mole on her arm. If she swims she is a witch and must be hanged; if she sinks the Lord have mercy on her soul." But Boylston then 42 years of age, a physician of some prominence, impressed as he says by what Mather had communicated probably talked the matter over with him and no doubt personally interviewed the slave Onesimus, who had been inoculated in Africa where he said it was done to everybody and "nobody died any more of the smallpox". In fact, as Mather himself says in the appendix to Variolae Triumphatae, he was informed of the wonderful new practise by this Garamantic servant some years before he was "enriched with the communications of the learned foreigners, whose accounts I found agreed with what I received from my servant, and thus in Africa where the poor creatures died like rotten sheep, a merciful God has taught them an infallible preservation. 'Tis a common practise attended with a constant success."

On the twenty-fourth of June, Mather wrote to Boylston a personal letter in which among other things he tells him, "If you should think it advisable to be proceeded in, it may save many lives that we set great value upon." Two days later Boylston inoculated his son Thomas, aged 6, and not long afterwards John, aged 13, and seven other persons.

The inspiration for inoculation in Massachusetts came then from Cotton Mather and from Cotton Mather only, but had Zabdiel Boylston not been the man he was, bold, determined, deterred by no obstacles, even Mather's wholesouled advocacy of the new practice, the prodigious energy with which his views were promulgated and the influence of his undoubted standing in the community would never have been enough to lead so many to submit to the operation, that Boylston became in a few months the leading inoculator not only in the New World, but in the Old as well. English physicians had waited seven years before acting. Boylston, with no knowledge of what was happening there, less than three times as many days. The storm broke; the other physicians would have no part in the matter; the mob, believing that inoculation was simply giving smallpox to those who might otherwise escape, were roused to fury. A legion of incendiary pamphlets appeared. Men declared that it was impious to interfere between the Creator and his creatures, that multiplying smallpox by artificial means was a wilful tampering with death. An anonymous writer did not hesitate to say that "the ministers have generally revolted from the good old days and set up a way that their fathers knew not of". "Most of them are for it which induces me to think that it is from the devil." The clergy almost unanimously supported Boylston. The physicians almost as unanimously derided his efforts. There were times when Boylston was truly in great peril. Thatcher declares that before the excitement subsided men patrolled the town with halters threatening to hang him to the nearest tree, that he once remained secreted in a "private place" in his own house for 14 days, while parties entered by day and by night in search of him and that even after the madness of the multitude had to some degree subsided he was forced to visit his patients by night and in disguise.

A certain Dr. Dalhonde, who had a considerable reputation for his knowledge of smallpox, gave it as his opinion that the practise was attended with the most pernicious consequences. By order of the selectmen he made a deposition concerning cases he claimed to have seen in Italy 25 years before and in Flanders and in Spain, all of which went to prove that the practise was nothing better than murder. This deposition, later shown to be false as inoculation was unknown in those countries at that time, was by authority published and even reprinted in England and caused, says Boylston, "a melancholy day to inoculation in its infancy and almost set the whole town against me and my methods".

In July Boylston in a long newspaper article describes anew the process of inoculation as performed in Turkey, regrets that the gentleman, "who only hath by him the letters of the foreign physician," refused to lend them and that he can therefore not give them in full, speaks

of the considerable number of Africans in town who can have no conspiracy or combination against us and who tell us what is done in Africa and says, "I know not why it is unlawful to learn of Africans." He pays his respects to those physicians "who will neither use this certain way to save the people's lives nor let anyone else use it", and inquires whether "one who makes the experiment upon himself that thousands of precious lives, if it succeed, be preserved shall deserve to be called a murderer and not rather esteemed as a great benefactor". "I take", says he, "the case to be this. Almighty God in his great mercy to mankind has taught us a remedy to be used when the dangers of smallpox distress us; may not a Christian employ this medicine and humbly thank God for his good Providence in discovering it to a miserable world? I have made my experiments on old and young, on strong and weak, on male and female, on white and black and on a greater number than I judge proper, considering the unaccountable rage of uncounted people. I have patiently borne the clamour and fear not the rage of the people. I might make answer against the scurrilous things lately published, but I decline foolish contentions."

Boylston was called before the selectmen and ordered to discontinue the practice, but he went calmly on inoculating all who came to him, nor was he estopped when later in the year the physicians of the town, probably at the instigation of Douglas, agreed as they said, "after mature deliberation, that inoculation had moved the death of many persons and had brought distemper upon many others which in the end proved deadly to them and that the natural tendency of infusing such malignant filth into the mass of the blood is to corrupt and putrify it". One hears much of "malignant filth" from the antivaccinationists of the present day. By October, 60 persons had passed through his hands, and by November 18, when smallpox was present in every street and almost in every house, 110. The town was by this time in a panic. Work was generally suspended. Many families moved away and the selectmen, when they later made up the statistics of the epidemic, declared that but 700 of the 12,000 inhabitants had proved immune to the disease. Such was smallpox 200 years ago.

Before the epidemic was over Boylston had inoculated some 247 persons, some say 282, but a few were treated by Doctors Thompson and Roby, who took up the work in Cambridge and Charlestown. Despite the statements of the physicians but six of Boylston's patients died and if any one of these particular persons had recovered, he thinks it would have been a miracle. After reading the detailed histories of these six, I am inclined to agree with him.

Into the turmoil of abuse and opposition had plunged the redoubtable Cotton Mather, the great religious leader of America, member of the Royal Society, a writer who left 300 books to his credit, who wrote with equal facility in Latin, Spanish, Greek, Hebrew and French, and whose English was forceful to a degree. Like Boylston he well remembered the epidemic of 1702 when three of his children suffered from the disease and he was in constant dread lest the same fate should befall the remainder of his family. Four times he alone or in conjunction with his father, Increase, and other clergymen, for the ministers were with him and against the physicians almost to a man, four times, he published pamphlets in answer to those of the opposition. "To say, as they have said", he wrote in one reply, "that we, the preachers, have been instruments of mischief and trouble both in church and state from witchcraft to inoculation is enough to make the most professed libertine blush." He speaks of papers "prostituted in hellish servitude" and states that "he knows of no nation in the world that has so openly and assiduously insulted the ministers of their God and been so strenuous in their endeavors to make them despicable and detestable to their people". But it was in his diary and particularly after a lighted hand grenade had been thrown into his chamber window and another into the sitting room of Boylston that he poured out his soul. No less than 71 references to smallpox and the attitude of the people of Boston appear between May, 1721, and July of the following year. Mather was terribly overworked, writing, debating, preaching, continually visiting the sick and called on to offer prayers for the dying. (He notes that on one day there were no less than 315 names on the prayer list of the Old North Church.) He was harassed over the serious illness of his wife. Four of his children acquired the smallpox, three in the natural way and one by inoculation. He was abused and insulted in public and in private and it is not to be wondered at that one finds allusions to "people who have Satan filling their hearts and their tongues against me and my family", to "the crying wickedness of a town strangely possessed of the devil", statements that he "should say that the town had become almost a hell on earth full of lies, murders and blasphemies, as far as wishes and speeches can make it," that he should speak of "the epidemic rage against that notable and successful way of saving the people from the dangers of smallpox" and conclude that "the miserable town is a dismal picture and emblem of hell itself". He resents, as well he might, the card tied to the grenade thrown into his house which read, "Cotton Mather, you dog. Damn you! I'll inoculate you with this with a pox to you", and speaks of "sottish errors, cursed clamors, senseless ignorance and raging wickedness, of the miser-

able, detestable and abominable town in which behold what my glorious Lord has brought me to. I have been guilty of such a crime as this. I have communicated a never failing and most allowable method of preventing death and other grievous miseries by a terrible distemper. I suffer for nothing but instructing your base physicians how to save many precious lives". But the gallant defender of what he thought was right was to live to see Dr. Douglas, his principal detractor, recant in the epidemic of 1728 and even exercise himself the erstwhile despised practise. His work in the support of Boylston is now largely forgotten, while every graduate of a primer of history is taught, as Dr. Dexter well says, "to sneer at his memory as the cruel and credulous apostle of the witchcraft mania and murders".

So many people poured into town seeking inoculation that the authorities of Boston transferred them all to the Spectacle Island Quarantine Station and Charlestown prohibited on penalty of a fine the entertainment of any person in order to receive smallpox by inoculation or otherwise. Inoculation was becoming popular. Improved methods were devised and Boylston, who had stood firm against a storm of abuse and bitterness almost unexampled, the press, civil authorities and the united profession against him, laughed at, jeered at, his life in danger, began now to be as greatly lauded as he had been a year before abused. In 1723 on the invitation of Dr. Hans Sloan, President of the Royal Society, he went to England, spoke before both the College of Physicians and the Royal Society of which latter body he was in 1726 elected a member. In eight months he had inoculated one third as many persons as were subjected to the operation in all England in the seven years 1721-1728. While in London he published his Historical Account of the Smallpox Inoculation in New England, in which he speaks of the cloud of opponents at the beginning "yet finding my account in the encouragement of good ministers I resolved to carry it on".

The death rate after inoculation in this 1721 epidemic had been 2.4%, after natural smallpox 14.8%.

In 1728 smallpox brought in by a vessel from Ireland was kept in a few families until March of the next year, when the "watches were removed" and it had free course with the result that in 1729 the General Court convened again in Cambridge and by 1730, when the epidemic ceased, there had been 4,000 cases and 500 deaths. Four hundred persons were inoculated at this time, of whom 12 died, 3%, while 13% of those taking the disease in the natural way lost their lives. The Town Council had by this time modified its views and publicly advised inoculation, and Dr. Douglas in a most ungracious letter accepted what he had so bitterly fought seven years before. He did himself no credit by writing—"How mean or rash soever the beginning of inoculation may have been, if many years practised by old women only and neglected by the sons of art in Turkey; if in another part of the world a person of no literature, of habitual rashness from the third hand hearing of an over credulous person, first attempted it indifferently to all who would pay for it, without regard to age, sex, constitution or other circumstances and cautions, which tryals of such consequences require, as it is one of the inconveniences of human life that all the world over ignorance assurance and rashness pushes on some to attempt without fear or discression what would make the most exquisite artist tremble to touch, nevertheless if in the event by repeated experiments it ought to prove useful, it ought to be embraced. And the Rev. Dr. Cotton Mather surreptitiously without the knowledge of his informer, himself, that he might have the honor of a new fangled notice sets an undaunted operator to work and in this country about 290 were inoculated." Yet this recantation ended the opposition on the part of physicians. Inoculation became an accepted procedure and with each recurring epidemic more and more submitted to it until in 1792 but 232 of the 8,346 persons who had the smallpox acquired it in the so-called natural way.

In 1751, brought in as usual by an infected ship, smallpox attacked but 124 individuals of whom 22 died. It spread slowly until May of the next year, but in December was again entirely out of control. Fences were built across streets near infected houses, flags of warning hung out, the tolling of bells at funerals suppressed, burials made at night, town meetings held in the open. Two thousand one hundred and twenty-four persons were inoculated, of whom 30 died—one in 70. Five thousand five hundred and forty-five acquired it in the natural way, 539 died—one in 11.

In 1764 the election sermon was omitted on account of the prevalence of the disease. In five weeks, 4,977 persons were inoculated, 46 died—one in 109. Six hundred and sixty-nine took it in the natural way, of whom 124 died—one in 5. Inoculation hospitals were now established at Point Shirley and Castle William. The hospital at the latter place was eventually moved to Noddles Island and Dr. Gelston, who had successfully treated 80 patients in a hospital on Martha's Vineyard, was placed in residence and Doctors Perkins, Whitworth, Lloyd and Warren were on call. It had become evident that for obvious reasons inoculation could not safely be practised in the midst of thickly settled communities.

In 1769 and again in 1773 new outbreaks caused the opening of more hospitals, one in

New Boston, the other near Marblehead. All these hospitals were chartered by the Governor.

In 1775, during the British occupation, smallpox prevailed both within and without the town and Washington's army was so seriously affected that wholesale inoculation was resorted to; 4,988 men were treated, 18 died.

In 1776 an act was passed permitting the erection of inoculation hospitals by the counties of the state and inoculation was forbidden except at such licensed hospitals. It was also provided that on the outbreak of smallpox such a hospital *must* be opened and to it all sick and infected persons removed, unless so ill that such removal would be dangerous, while any householder who failed to give notice of a case in his family was to be fined not less than ten pounds and no more than thirty.

During 1778, 2,121 inoculations were performed with 29 deaths, 9%; 122 other cases were recorded with 42 deaths, 34%.

In 1792, smallpox being brought in by a vessel from Ireland, practically the whole town was inoculated within a few days. The desirability of this procedure was now almost universally accepted. There were, however, at least as late as 1798 a few conscientious objectors still believing that inoculation would be followed by divine punishment. So common was the procedure, so freely did the inoculated mingle with the general public, that smallpox was being kept alive by the very means used to modify it and was indeed the reigning disease until the end of the century, it being estimated that in the years between 1700 and 1800 in Europe alone, whether acquired by inoculation or in the so-called natural way, it was responsible for no less than 60,000,000 deaths.

The 1792 legislature recognized the dangers of inoculation as then practised and redrafting the act of 1776 provided that on the outbreak of smallpox all infected persons must be removed to a hospital devoted to their care, repealed the rather drastic fine of ten pounds and thirty pounds for non-notification, forbade on penalty of $200 the inoculation of any person or one's self or the allowance of one's self to be inoculated save in such licensed hospital and ordered a display of red flags to warn travelers. Householders, physicians and others, who neglected to notify the authorities of smallpox on their premises were to be fined $100 and anyone violating any of these provisions was assessed a similar sum.

In 1797 it was in addition provided that if a person could for any reason not be moved to a hospital, provision must be made for him in the house in which he might be, persons in the neighborhood to be removed by the Board of Health. The Board of Health might also turn back travelers, prevent them from moving without a license, make them return to the place from whence they came and fine them for disobedience not more than $100. It was also specifically provided that under order of a justice of the peace such Board might secure baggage, clothing, etc., supposed to be infected, might break open any house or shop, might require any person to render aid and that such person must serve or be fined $10.

In the one hundred years before inoculation there had been 12 distinct epidemics of smallpox, in the 80 years during which inoculation was used eight. In the 129 years since the introduction of vaccination two general outbreaks have occurred and two only, and yet there are those who say that vaccination is of no value and a gentleman now or formerly the President of the American Medical Liberty League writes to me in this year of grace to say that smallpox is not even contagious.

In 1799 Dr. Benjamin Waterhouse of Cambridge received from Dr. Lettsom of London a copy of Edward Jenner's Inquiry into the Causes and Effects of the Variolae Vaccinae or Cowpox published the year before. Waterhouse then Hersey Professor of Theory and Practise in the Medical School was probably the best educated physician in the State at that time, having spent seven years in study in London, Edinburgh and Leyden. Dressing always in formal broadcloth and carrying a gold-headed cane, somewhat condescending to his fellow practitioners whose knowledge he held in little esteem, contentious to a fault, with manners by no means agreeable, he was always in hot water and was eventually deprived of his professorship at the demand of all the other teachers in the school. A Jeffersonian democrat when all his associates were Federalists, a member of the unpopular Society of Friends, a person almost universally disliked, this man of action overcoming all handicaps was nevertheless able by hard work, persistence and the brilliancy of his intellect to place vaccination on a firm basis in this country for which work he was honored by scientific societies both here and abroad and by the London Medical Society voted the title of the American Jenner. He, like Boylston before him, lost no time in placing himself on record for on March 12 of the same year, 1799, he published in the *Columbian Sentinel* a short account of the new inoculation method under the title of "Something Curious in the Medical Line." As he himself says, this attracted but little attention. "A few received it, some doubted it, some observed that wise and prudent conduct which allows them to condemn or applaud as the event might prove, the greater number absolutely ridiculed it." Later in the year, before a meeting of the American Academy of Arts and Sciences he read a paper based on Jenner's pamphlet and quoted as much as he could remember of "Pear-

son's Inquiry into the History of Cowpox", a book which he had loaned and lost. At the next quarterly meeting he read extracts from Woodville's book just received. Woodville made a bad blunder when he vaccinated a number of persons and then in four to five days inoculated them with smallpox virus, thus producing both vaccinia and smallpox. This contaminated virus used as cowpox virus spread smallpox far and wide and owing to Woodville's prominence in the medical world came near to shipwrecking the great discovery.

Waterhouse finding, as he says, the evidence in support of the efficacy of vaccination too great to be resisted by any mind not perverted by prejudice, tried to obtain the virus in an active state. After several fruitless attempts he at length received some from Dr. Haygarth of Bath and on July 8, 1800 vaccinated his son Daniel, aged five. The course of the disease being typical, he vaccinated another son, aged three, with virus from the arm of the first, then a servant boy of twelve with the imported material and finally an infant of one with its nurse both from the arm of the three year old. Be it noted that he as well as both Lady Montague and Boylston before him, only after he had convinced himself by experiments on his own family attempted to induce other people to follow his example. As Waterhouse invited some of the physicians to see the boy the first of a long series of perversions of fact began in a report industriously circulated that one of his children was so ill that a consultation of several members of the faculty was required. Many persons now applied to him begging for vaccination, but he refused to proceed until he had proved that the new agent really gave the protection that he was convinced it did. He therefore wrote to Dr. Aspinwall, a specialist in inoculation, who was in charge of the smallpox hospital in Brookline in part as follows:

> "I have collected everything that has been printed respecting this distemper cowpox and have been so thoroughly convinced of its importance to humanity that I have procured some of the vaccine matter and therewith inoculated seven members of my family. My desire is to confirm the doctrine by having some of them inoculated by you. I can obtain variolous matter and inoculate them privately, but I wish to do it in the most open public way possible. As I have imported a new distemper I conceive the public have a right to know exactly every step I take in it. I write therefore to inquire whether you will on philanthropic principles try the experiment of inoculating some of my children who have undergone the cowpox. If you accede to my proposal I shall consider it an experiment in which we have co-operated for the good of our fellow citizens."

Dr. Aspinwall, whose living it must be remembered depended on the prevalence of smallpox, at once consented and two months after vaccination the children were sent to him, exposed to the infection of smallpox in the hospital and inoculated with fresh matter taken from a patient. Subjected to this most crucial test with absolute resistance to the disease Waterhouse was justified in saying as he did, "One fact in such cases is worth a thousand arguments." Of Aspinwall he said afterwards, "He took all those of my family whom I had vaccinated into his smallpox hospital and there tested them to his satisfaction and then said to me and to others, 'This is no sham. As a man of humanity I rejoice in it though it will take from me a handsome annual income.'" There was trouble with inert vaccine and it was necessary to obtain new supplies; there was trouble with vaccination improperly done or done by incompetent persons; vaccine contaminated with smallpox virus came into the country as Dr. A. K. Stone has pointed out. The other physicians so disliked Waterhouse that they were prejudiced against anything that he advocated and it was nearly two years after President Jefferson wrote to him speaking of his firmness and perseverance maintained against the persecution of his enemies, religious, political and professional that he was able to persuade the Board of Health to endorse the experiment which was to settle once and for all the question of the value of vaccination as a preventive of smallpox.

Undismayed by the rejecting in 1800 of a similar request made by James Jackson who had studied under Woodville and had supported him (Waterhouse) in his work as a vaccinator, he arranged in August 1802 for the admission of 19 children vaccinated in the preceding November to the smallpox hospital at Noddles Island, where they remained for twenty days constantly exposed to infection and were one and all inoculated with smallpox virus. Not one of these children developed the disease, but two unvaccinated children admitted at the same time and also inoculated showed the typical variolous pustules in profusion. Matter was then taken from these children and the 19 re-inoculated, again with no result. There was nothing more to be said. The value of vaccination was conclusively proved. All these proceedings were under the supervision of a committee of physicians consisting of James Lloyd, Samuel Danforth, Isaac Rand, John Jeffries, John Warren and Charles Jarvis. Waterhouse's memorial to the Board of Health is a model of persuasive argument. He speaks of vaccination as the most important discovery since the world began, it being no less than the extermination of the most loathsome and widely wasting pestilence that Providence ever permitted to affect the human race. He gives the story of Jenner in de-

tail, derides those wise sceptics on account of the so-called lowly origin of the practise and ends by telling the Board that the proposition is brought forward by no cringing solicitor but by a man conscious of his duty and zealous in producing a public benefit of more value to Boston than all the riches contained within its limits. "You are not asked", said he, "to accept blindly but to cause a rigid inquiry to be made as to the truth of my assertions and have them subjected to the test of a public experiment by a set of men whose knowledge, age and virtues will create confidence and inspire satisfaction." And this was the man who among other things had been publicly denounced as "an old drone enjoying the sweets of the beehive without assisting in the labor or paying for the privilege of humming and buzzing".

Verily the path of those who have tried to banish smallpox from Massachusetts has been a stony one and the attitude of our profession toward these men and women has not always been one of which to be particularly proud. Indifference, ridicule and opposition hindered the few whose clearer vision and greater courage led them to experiment with the new methods and as we shall see later overconfidence and a desire to save themselves and their patients from trouble set back the clock, undid much of the work already accomplished and allowed the almost banished disease to return and plague the community for a long period of years. It was eight years after the first vaccination and six after the Noddles Island experiment that a committee of the Massachusetts Medical Society reported to the annual meeting that persons who undergo the cowpox are thereby rendered as incapable of being affected by the virus of smallpox as if they had undergone the latter disease.

In 1809 the town of Milton repeated the Noddles Island experiment with identical results and in that year the Legislature ordered that every town, district and plantation where no board of health existed should choose three or more persons to supervise the inoculation of the inhabitants with cowpox, in 1816 that a smallpox patient might be removed from a jail to a hospital under guard and in 1827 that a physician visiting a patient having smallpox must give notice to the authorities.

Vaccination had supplanted inoculation. Smallpox had disappeared as a major disease. There had been no epidemic since 1792 and between 1811 and 1837 there were but 39 deaths from the disease in Boston. And then the physicians as confident as they had been hesitant in 1800 appear in the guise of a committee of the Massachusetts Medical Society before the Joint Committee on the Judiciary complaining that the laws passed in 1792 and 1797 were useless, vexatious and burdensome, that personal rights were interfered with, individuals and the public subjected to unnecessary expense, deprived of the comforts of home by removal to public hospitals and that physicians were now compelled to report these cases to the proper authorities and thus subject their patients to the provisions of severe and as they believed unnecessary laws. This petition was signed by twenty prominent persons, thirteen of whom were physicians, among them John C. Warren and James Jackson. The result was most disastrous, for the Legislature at its next session repealed practically all laws for the control of smallpox. Immediate transfer to a hospital was no longer required, isolation of those not so transferred no longer compulsory, flags were no longer to be displayed, travelers turned back, nor physicians obliged to report cases, and the whole system of fines was abolished. But, as Dr. Burrage notes in his history of the Society, the Committee proud of its work reported back to the Council, expressed its confidence in vaccination and the Council voted that this Society should furnish free vaccine to all Fellows who applied for it, but that it was the duty of every Fellow to vaccinate gratuitously on each Monday of the month of June annually all persons who might come to them and be unable to pay the usual fee. This vote has never been repealed and this duty is, I must assume, still annually performed.

In 1839 and 1840 physicians were again ordered to report cases and fines for neglect were again legal, but with these exceptions no further changes in the laws were made until 1855, seventeen years later.

Following this legislative action of 1838 smallpox at once increased, there being in Boston alone 1,032 deaths in those 17 years, in contrast to the 39 of the previous 26. This could not be allowed to continue and in 1855 the legislature enacted laws much more drastic than those of 1792 thrown into the discard 17 years before. The managers of manufacturing companies, the superintendents of almshouses, state schools, lunatic hospitals, masters of houses of correction, jailers, prison helpers and the heads of all other institutions supported in whole or in part by the State were ordered to immediately cause to be vaccinated all inmates and all entrants. Boards of health were given authority at any time to vaccinate all the inhabitants of any town. A parent or guardian who neglected to cause his child or ward to be vaccinated before he attained the age of two, unless he had the certificate of a physician that said child was unfit, was to forfeit $5 for every year during which such neglect continued and the school committees of towns and cities were ordered to allow no unvaccinated child to be admitted to or connected with the public schools. There was, however, no efficient enforcement machinery in existence. The State Board of Health was not formed until 1869, 14 years later, although a bill for its establishment had been introduced as early as

1849, and throughout the fifties and sixties the yearly deaths from smallpox were not materially diminished, the average for the next 18 years standing at 150 culminating in the general epidemic of 1872-3, incidentally the first one for 80 years with its 1,697 fatal cases, 1,040 of which were in Boston. That epidemic proved to be a disguised blessing, for vaccination again became popular, the vaccination laws were more rigorously enforced and since that date, with the exception of the state-wide outbreak in 1901-1902 with its 3,509 cases and 381 deaths, there has been no year in which the fatal cases have exceeded 100, and there have been a number of years with no deaths, the total fatalities in the 59 years excluding the outbreak above mentioned being but 419, 26 of which have occurred since 1913.

The 1855 laws were somewhat modified in 1884 and again in 1894. With a physician's certificate an unvaccinated child was allowed to attend school. Per contra children from homes where contagious diseases were present were rigidly excluded. Employees in manufacturing establishments and inmates of institutions were to be vaccinated as all other persons only on orders of the Boards of Health. The provision which exempted from the school law the unvaccinated child with the physician's certificate was repealed in 1902 to be reënacted in 1908 in which latter year the infant vaccination law was wiped from the slate, despite the strong opposition of Dr. George W. Gay, at that time President of this Society.

For more than fifty years annual attacks have been made by the anti-vaccinationists, conscientious objectors and Christian Scientists on the school law, fortunately so far without avail. The law has in fact been strengthened by providing that the physician giving an exemption certificate should at least have seen the patient, which in the past had not always been the case.

Smallpox has become instead of the most dreaded and virulent of diseases one comparatively rare in this State, one not too difficult to control when it does occur, one absolutely preventable were vaccination universal, yet a persistent, well-organized, well-financed opposition tries year after year to throw open the doors to the enemy always ready to enter and in due time bring us to the condition of our forefathers, smallpox always present with a serious epidemic every ten to twenty years.

In no state in the Union has more, not even so much, been done to control, mitigate and finally almost suppress the disease so easily robbed of its terrors, so easily banished, but so ignorantly allowed to run its course almost unchecked in a large portion of the country. It is a melancholy fact that the countrymen of Jenner, Boylston, Waterhouse and Lady Montague lag so far behind those of other races and other countries in these controlling efforts. It is shameful to read in the Epidemiologic Intelligence of the League of Nations that while India reported 148,199 cases of smallpox in 1929, the United States 41,705 and England 10,967 no other country reported over 1,000; and still more so to learn from the same source that in 1930 there were 46,712 cases reported in the United States, 11,839 in England and Wales and but 268 in all continental Europe exclusive of Spain, Portugal, Greece and Russia. Nor can we read with satisfaction in this same report that the efficacy of smallpox vaccination in preventing and limiting outbreaks is clearly shown by the progressive decline or even the eradication of smallpox in countries of central and eastern Europe where vaccination has become general, while the disease persists or even spreads in England and the United States where vaccination is not in fact universally compulsory. The death rate is at present in most countries low, but its virulence may at any time increase as it has repeatedly done in recent outbreaks in the middle west. Forty-eight thousand died of smallpox in India in 1930, nobody knows how many in China, and while virulent smallpox exists anywhere in the world an unvaccinated community is always in danger.

It is only by the most persistent efforts that our law requiring the vaccination of public school children has been kept in the statutes and more or less persistent efforts kept up for now 17 years have failed to extend the aegis of compulsory vaccination over those attending our private and parochial schools. Some day it will come. When, I do not know.

NEW ENGLAND HEART ASSOCIATION

RAYNAUD'S DISEASE*

BY SIR THOMAS LEWIS†

SIR Thomas Lewis presented a brief summary of his theory as to the mechanism of Raynaud's disease. He gave a general idea of experimental work done to support his views and illustrated some of these methods by drawings upon the blackboard. He reached the conclusion that these well-known interesting phenomena are not due to any dysfunction of the vasomotor system but to a "local fault", probably in the arteries of the digits involved. Inasmuch as an overwhelming amount of work has prevented his writing a special article for this meeting, we have, with his permission, abstracted the magnificent article published in collaboration with Professor William J. Kerr in *Heart*, Vol. XV, pp. 7-101, August 1929, entitled "*Experiments Relating to the Peripheral Mechanism Involved in Spasmodic Arrest of the Circulation in the Fingers, A Variety of Raynaud's Disease.*" One must realize that it is easy to convey the wrong impression, either by misinterpretation of the author's wording or by emphasis on certain portions of the article. For this reason, actual paragraphs will be transcribed in an attempt to convey Lewis' evidence correctly. It is recommended that the original be read and quoted rather than this abstract.

INTRODUCTORY

"It will be acknowledged generally, we suppose, that an obstruction of the blood flow to the digits underlies the malady in which fingers or toes become periodically pale or cyanotic and in which, after several or many winters of repeated attacks of this kind, terminal portions of the digits may actually be lost by a process of slow dry gangrene. The matters mainly discussed in this paper are the site of this obstruction, its nature, and the way in which it is brought about. Upon these matters there has not been unanimity of opinion."

"Before proceeding, it is necessary to define what we mean by this convenient term, 'attack'. No more is meant than the occurrence of a full cyanotic tint (with or without pallor) in such parts of the hand as are accustomed to present it periodically."

Material Studied and Its Grouping

"After careful study it becomes possible in most patients to state the particular conditions under which an attack will occur, to induce it by various means and almost at will in an examination room."

Many patients were studied but statements are confined to observations on nine of these: three of a severe type that had experienced dry gangrene (Cases 1, 2, and 3); four of a mild type of multiphase color changes without gangrene (Cases 6, 7, 8 and 9); and two of an intermediate grade (Cases 4 and 5).

Lewis referred to his chart of standard colors, numbering the degrees of pallor, redness, and cyanosis. "The manner in which the colours change from blue to red and red to blue in the fingers of these patients has been studied and described in detail because, if the matter is treated superficially and with a neglect of the time relations and temperature of the fingers, serious errors of interpretation are certain to occur; and fanciful hypotheses involving spasms of vessels of this order and of that are apt to be put forward to explain a simple series of events." Surface temperatures taken by means of the thermocouple are followed closely.

"In the mild case, recovery is heralded by redness, and this is followed by a return of normal skin temperatures. In the severer cases redness signals only a tendency to recovery, namely a slight relaxation; there is no real recovery at moderate room temperatures.

"It has been the rule for the temperature of the fingers to move up or down quickly to that of the examination room, whenever either of these patients (Cases 1 or 2) has entered the latter. This has been so when the room has previously been fixed at temperatures ranging from 10° to 20°. If, while the patient is in a room at any intermediate temperature, a finger is warmed above or cooled below that room temperature, a return of the temperature of the finger towards that of the room begins immediately. And this movement continues until room temperature, or a point very close to it, is again reached.

"The interest of these observations lies in the conclusion that in patients of the severer type, such as are here exemplified, the fingers, at least while they are at rest, remain at or about the temperature of their surroundings in rooms at ordinary temperatures during the whole of at least the colder months of the year. During these months there will be frequent periods of exposure to cold during which the circulation to the fingers will stop altogether; the intervals between will be periods not of normal flow, but of very slight flow. These considerations bring a

*Summary by Dr. Arthur W. Allen of talk by Sir Thomas Lewis given at the meeting of the New England Heart Association, November 4, 1931.

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clearer understanding of why nutrition in the fingers suffers and why from time to time portions of the tissue die and come away in the form of dry gangrene; there is no need to invoke trophic influences in accounting for this process. Amongst our patients it is only in the cases in which the fingers have been found to follow room temperature slavishly that gangrene has occurred, though seemingly, from the example of Case 4, gangrene does not necessarily occur."

Recovery After Overcooling

"The manner in which the fingers respond to overcooling is one closely connected with the matters just discussed, for the reaction of the normal subject and of the milder cases is not shown by the severer cases.

"The reaction to be described has been mentioned briefly at an earlier stage. Very many observations have been carried out upon normal subjects during the last few years to explore a curious and important response of the skin to cold. They may be summarized here very briefly in so far as they are relevant. When, in rooms at moderate temperature (17° to 19°), a normal finger is immersed in water at 0° for 5 or 10 minutes and is then withdrawn and gently wiped dry, it subsequently shows a reaction, becoming a good deal hotter than its neighbors, often by several or many degrees centigrade. The reaction is not confined strictly to the area cooled, but spreads a little beyond it. It is normally at its height about 15 or 20 minutes after the end of immersion and continues for a period of about 40 to 60 minutes. In the circumstances named the reaction is almost invariable and conspicuous. A similar reaction, though of lesser degree, occurs if the water is at 5° or 10°. The rise in temperature of the finger is accompanied by a bright and lasting redness and is evidently due to a local opening up of arterioles; it is at present regarded, for reasons that we cannot here enter into, as a local reflex comparable to that underlying the flare in and around an area of injury. The actual mechanism, however, is one still under consideration, and it does not directly concern us here.

"The reaction has an important protective function, causing a rapid rewarming of fingers that have been excessively cooled. It is known to be very frequent in cold weather in normal people and is clearly of considerable consequence to the nutrition of fingers and other parts of the body that are liable to frequent exposure.

"It was because we overcooled the finger or hand in our early efforts to produce full cyanosis that we were disappointed, being left not with blue but with red fingers, in which the circulation was still continued.

"It has been seen that the reaction to overcooling in these patients differs from that of normal subjects in failing to show any appreciable rise of temperature; it exhibits itself by a maintained redness of the skin, which may last for several hours. In other words, and so far as it has been discussed, the reaction in the abnormal finger seems to differ from that of the normal in its degree and duration only. In both instances vasodilatation occurs; in the latter it gives a conspicuously increased flow; in the former it relieves complete spasm and produces a just appreciable flow, this relief lasting for unusual periods of time. The difference is not due to any fundamental difference of mechanism in the two types of case, but results simply from the counteracting spasm of the vessels, which, as we have seen, is almost constant at moderate room temperatures in such patients as Case 1 and Case 2. It is not really justifiable to compare the reaction of normals and abnormals to overcooling at moderate room temperatures, because the fingers of normal people remain for the most part above those temperatures while those of the abnormal patients do not. If we arrange the room temperatures at such levels that the fingers of normal subjects fall to 16 or 17°, then, sometimes, the temperature reaction similarly fails in these also.

"To test the matter further we have maintained the hand of the abnormal subject at a minimal temperature of 26°, by enclosing it within a warm box (previously described). In these circumstances, and with the body at a room temperature of about 18°, a temperature reaction to overcooling may be obtained on occasion.

"The demonstration in the first example that the mechanism underlying the reaction to overcooling is intact has this importance; it shows that the lack of such a mechanism is not the cause of persistent spasm in response to cold. The proper interpretation is that the fault in the vessels which causes spasm prevents the reaction from displaying itself fully. If the vasodilatation that normally follows overcooling is regarded as a response to a change in the tissues produced by cold, then we may safely assume that this change also occurs in the patient, but that the vasodilatation, the natural response to this change, is held in check or prevented by the simultaneous tendency to vasoconstriction.

"In incomplete measure the fingers that are overcooled are compensated, since for some time afterwards the spasm in the digital vessels may remain incomplete and the fingers red, while the vessels of other fingers, which have not been overcooled, pass into complete spasm and become cyanotic. In some patients this redness persists for hours and, in suitable warmth, the circulation in the previously exposed fingers improves sufficiently to bring their temperature somewhat above that of their neighbours. Thus, in Case 1 we were able, by immersing one hand in cold water (5°) for 10 minutes several times a day, to maintain its circulation in a constantly better state than that in the untreated hand. When this treatment was interrupted after its use for

several weeks, the improved condition of the hand so treated was maintained in large part. The method should be explored further."

Order of Invasion and Retreat

"In attacks of cyanosis the portion of the finger affected is its distal part, the tip, the last phalanx, the last two phalanges, or the whole finger. At the onset, either the finger becomes discoloured simultaneously in all its affected parts or, more usually, its parts are involved successively. In the latter case the march is from the distal part to the proximal; and, if there is successive recovery, then the order is reversed. It is a rule, to which there are no more than occasional and unimportant exceptions, that if a proximal portion of a finger is discolored, the more distal parts are discolored also. This distribution suggests that the site of the obstruction is in the main vessels of the finger."

Relief of Spasm by Local Heating

"When vessels of the hand are in spasm and the circulation to the fingers, with or without that to parts of the hand, has come to a standstill, as indicated by the signs previously detailed, the spasm can be relieved and the hand restored to a pink or red colour by soaking it in warm water, for a shorter or longer period. By exposing different parts of the hand to warmth in this way, a good deal is learned about the vessels actually involved in the spasm.

"When only the distal half or two-thirds of a finger showing cyanosis in its whole length is immersed in hot water, the vessels below the water line alone experience the local dilating influence of heat. Their dilatation, evidenced so far as the minute vessels are concerned by increased depth of colour in the corresponding skin, does not open up the circulation, because an obstruction exists in the main digital arteries above the water line.

"If, as an alternative, however, the palm of the hand is heated, any vessels in spasm within it or in the immediate roots of the fingers will open up and the blood flow to the bases of the fingers will quickly be renewed. The skin is overheated locally and here the flow will be freer than normal, will warm the neighbouring part of the finger and cause its vessels to open, and thus the circulation to the whole length of the finger will be opened up, though, as we have seen, very gradually and progressively from root to tip. Recovery in the fingers is always complete, though on occasion the day in recovery at the extreme tips is a little longer. The opening up of the vessels to the finger tips is not preceded by a material rise of temperature of the tips; it is not due to warmth directly transmitted from the bath. The temperature in general remains unaltered until it rises 1° or 2° soon after the finger tips become red.

"It is to be noted that we do not suppose that only vessels in the palm or roots of the fingers are involved in spasm; if that were so, then relaxation of these vessels would lead to prompt and not gradual flushing of the fingers.

"Thus, these observations upon the effects of local heating during spasm are consistent with the supposition that, when the fingers are involved by cyanosis in their whole length, the vessels implicated are the digital arteries in their whole length. They exclude as the cause of the obstructed bloodflow vessels of a smaller order than these, though they do not exclude the possibility that arteries or arterioles of a smaller order are simultaneously involved, or that vessels of larger order and of the size of the palmar arch are implicated.

"That the effects of heat are local and are not excited reflexly in these experiments is evident from the failure of the thumb to revive, immersed,—an observation we have made on more than one occasion."

Production of Spasm by Local Cooling

"These observations show that there is a definite and rather precise relation between the area cooled and the area in which the bloodflow ceases. In the case of cold limited to the fingers, the area of discoloration is less than the area of cooling by the length of a phalanx, or somewhat less; thus cooling the last two phalanges of the finger leads to spasm over the end phalanx only. This distribution again provides evidence against spasm of the minute vessels or of cutaneous arterioles being concerned in the actual cessation of blood-flow, and indicates that the main digital vessels are involved; assuming that these vessels contract to the water line, and that their branches arising higher and descending to skin lying below the water line are unaffected, the distribution of the skin discoloration is explained.

"Repeated tests in both patients have shown that, once the cold box produces an obstructed blood flow, this flow remains obstructed so long as the cold water flows, but that if the cold stream is at any time replaced by one of 30°, the cyanosis vanishes within a few minutes. When the cyanosis begins to pass away from a finger in these circumstances, it leaves the finger completely within a few seconds. The recovery is not gradual and progressive from base to tip as it is when the vessels within the finger itself have been involved in the spasm and the palm is warmed."

Summary of and Comment upon Chief Observations upon Local Heating and Cooling

"It is evident from the observations upon local heating that, in spontaneous attacks of vascular spasm of the fingers, this spasm can be relieved by warmth locally applied; warmth ap-

plied at such a distance that it can act only reflexly is ineffective or at the most is far less effective. Relief as a local effect can come, however, only when the most proximally placed contracted part of the vessel is influenced by the heat; heat applied at the end of a finger does not release spasm in it if the spasm extends to its root. A release of spasm at the root by an application of heat in that situation does not lead at once to a restored circulation to the tip of the finger; the circulation is very gradually and slowly restored as the warmth is conveyed by the circulation reëstablishing itself from root to tip. Thus in the severer cases it is necessary that part of the palm should be warmed; complete immersion of the hand most quickly restores the circulation. These observations point to spasm of the digital arteries in their length and exclude minute vessels and arterioles as the cause of obstruction.

"The observations upon local cooling are in agreement. The circulation to the end of a finger or to half or to the whole of a finger may be stopped by suitably cooling the main vessels to the finger in their length or at their origins.

"When a hand is exposed to cold out of doors, the arteries first to experience cold of sufficient degree will be those of the fingers, and especially of the distal parts of the fingers, since the blood is cooling as it travels to these parts and they are of smallest circumference and lose heat quickest. Longer exposure will involve a greater length of the artery in the finger and eventually the same vessel may suffer in the palm. Thus the phenomena described in the patients with whom we are dealing are adequately explained if we suppose that the vessels of the order of the main arteries of the fingers show an increased tone at certain relatively low temperatures; exposure for a short period will cause loss of circulation to the finger tip; as the exposure lengthens, the temperature of more protected parts of the artery will fall to the critical point and more of the finger will become implicated; ultimately even portions of the hand and arm may suffer by successive involvement of vessels of the same order.

"The reactions displayed to heat and cold experimentally tested do not seem to us to be compatible with the current view that the vascular spasm is a vasomotor phenomenon. We have no evidence from which to suppose that vasomotor impulses, when weakly aroused, confine themselves to the tips of the digits, and that their influence spreads in stages up the digits to their roots and thence up the limb as the nervous impulses increase in force. The evidence from animal experiment is of a different kind and indicates a general contraction of the vessels supplied by the nerve stimulated, less intense or more intense over the whole field according to the strength of stimulation.

"Another fact that is difficult to explain upon a vasomotor basis is that the vessels of single fingers are brought to spasm by cold applied to them in these patients. In these circumstances, a vasomotor hypothesis must suppose that an impulse created by cold is conveyed to the central nervous system and is reflected mainly, if not exclusively, to the same small skin territory; that it is reflected exclusively to such an area is opposed by direct evidence; reflex vasomotor impulses created by cold are known to be conveyed very widely; that it is reflected chiefly to such an area is unsupported by any direct evidence of which we are aware, and much may be said from a less direct standpoint against such a view, notably that a very large number of cutaneous areas would necessarily require, in these circumstances, separate representation in the central nervous system.

"Thus, observation upon the results of local cooling of the fingers in our patients leads us to conclude that there is an abnormality of their arteries, displaying itself in hypersensitivity of these vessels to relatively low temperatures and that the effects of cold are not produced through the intervention of the nervous system. More evidence relating to the last statement will be brought forward at a later stage.

Volume of the Digital Impulse

"The primary object of the observations now to be recorded was to explore further than had been done previously the question of spasm in the arteries of the fingers; to try to bring more definite evidence as to whether or not the circulatory defects are due purely to change in the tone of the vessel walls or, in part at least, to disease of these vessels. The method of approach was to try and ascertain the extent to which the vessels can open.

"The chief features displayed by these curves are as follows: The normal curve is one that rises with each change of 5° (from 20° or 25° to 45°) and by increasing increments. The curves given by the patients of milder type are similar to the normal, departing from these neither in form nor amplitude over the range of temperature tested.

"The curves given by patients of the severer type are abnormal in two chief respects: First, there is no detectable rise, — there is certainly no material rise,—in the curve until a temperature of about 30° is reached. The pulsation in the vessels up to about this temperature is definitely less than normal. The observation is consistent with the previous evidence that the fingers of these patients do not rise above surrounding air temperature until the latter is carried to a high point.

"The evidence that has now been discussed is consistent with the view that in the milder cases the arteries and arterioles of the fingers are

healthy and capable of full expansion throughout their length. In the severer cases the vessels are unquestionably capable of very considerable expansion, but full expansion cannot always be shown. The defect in expansion appears especially in fingers in which there has been distinct loss of substance and to be particularly prominent in vessels supplying the tips of the fingers in the region where the loss of substance has actually occurred."

Blanched Fingers

"The theoretical importance of a blanched skin (colour K) lies in the fact that simple arterial obstruction will not produce it, provided that, as is usual, the hands lie below the level of the heart, and in the fact that a strong vasoconstrictor nervous impulse can probably produce full blanching of the skin by causing contraction of the minute vessels. If it could be shown in our patients that blanching of the fingers may be due to active contraction of the minute vessels, then such contraction would, in the absence of other equally reasonable explanation, constitute evidence favouring the hypothesis of vasomotor impulses.

"In studying this question it is important to place on one side those instances of pale, but incompletely blanched, fingers already considered, and to remember that many patients do not distinctly differentiate between the two. It is essential that actual observation should take precedence to statements by patients.

"Now it is the rule in this malady, as Raynaud knew, and as is illustrated by the present series of cases, for patients to state that the order of colours displayed in the attack is first white, then blue, and finally red in the stage of recovery. This statement is made with much frequence and emphasis by both patients and writers. It has been made by almost all the patients of the present series. To contrast with it, however, we have to record that amongst the large number of spontaneous and provoked attacks that we have seen from their beginnings, in *not a single instance* has such an attack started in blanching of the skin. We have seen attacks start in all our patients; they have always begun with cyanosis. It is true to say, therefore, that in not a single case of our series has blanching of the skin been an essential feature of the attack. We come back to the discrepancy between our observations and the patient's statement, and believe the reason for it is generally to be found in the circumstances in which attacks occur. In the attacks occurring under our observation the hands have always been still; in attacks in which blanching is described as an early event by the patient, the rule is that the hands are in use.

"If a patient is using her hands, attention is usually first directed to them by the onset of numbness, since this interferes with work; looking at the fingers at such times, the patient often finds them pale or blanched and relates this as an early symptom.

"The form of blanching just described is passive; it gives place invariably and within a few minutes to cyanosis when the hands are held at rest. There is a second type which holds for much longer periods while the hands are at rest. This form can be shown to be active in the sense that it results from contraction of the minute vessels.

"To sum up, pallor, slight, conspicuous or amounting to actual blanching, occurring in the fingers in the attacks is due to a variety of causes. There is no grade of pallor that is not to be explained as a simple consequence of, or as a natural sequel to, loss of the arterial stream to the fingers under suitable conditions. It is unnecessary to invoke the aid of vasoconstrictor impulses to explain the pale or the blanched finger, even though these may result from active contraction of the minute vessels."

THE RÔLE OF THE VASOMOTOR NERVES

Anesthesia of Ulna Nerve

"To gather further and more direct evidence concerning the influence of the vasomotor nerves upon spasm of the digital arteries we have resorted on several occasions to anesthetization of the ulnar nerve, by injecting the tissues near it at the elbow with a few ccs of 2 per cent novocaine in a weak adrenalin solution. There are four examples of this observation." The actual examples will be omitted in this abstract as the comment which follows covers the situation.

"On the basis of long accepted physiological experiment, we have the right to assume that the vasoconstrictor nerves pass to the vessels of the limb in the mixed nerves and that, at least so far as the peripheral parts of the limb are concerned, this is their exclusive path. We are quite aware that a different view is held by certain clinicians but, having read the evidence available, we find ourselves wholly unconvinced that there are vasoconstrictor paths of any length in the coats of the arteries, or that this idea at present merits further discussion.

"Our contention is that such a nerve as the ulnar carries the supply of vasoconstrictor fibres to much the same cutaneous territory as that to which sensory nerves are carried by this trunk, a contention that is supported by our present observations that the areas of anesthesia, of reddening, of sweating, and of dilatation of the veins, closely correspond when the ulnar nerve is paralyzed. It is supported by similar observations that have been made previously upon nerves of the arm in this laboratory and by previous workers (Trotter & Davies). It is supported by the much higher temperatures that prevail, after ulnar anesthetization, in the ulnar territory as compared with the remainder of the hand, *provided that conditions are suitably ar-*

ranged to show these differences. Because there is in the case of the 4th finger the probability of an overlapping distribution from ulnar and median nerves, our conclusions are drawn from the fifth finger only.

"We believe that complete anesthetization of the ulnar nerve blocks all vasoconstrictor paths to the 5th finger; it most certainly paralyzes the main vasoconstrictor supply. In relation to this vasomotor paralysis our observations may be said to provide the following demonstrations for our cases of the severer type:

"(a) Paralysis of the vasoconstrictor nerves does not prevent the vessels of the fingers from being subsequently thrown into a complete obstructive spasm by a local application of cold. Thus, it is directly demonstrated that complete spasm of susceptible digital vessels can be produced without the intervention of vasomotor impulses, normal or abnormal.

"(b) If the vessels of the finger are already and spontaneously in a state of full spasm when the vasomotor paralysis takes effect, the paralysis does not greatly relieve this spasm; it produces only a little relaxation of the vessels from their complete closure, a relaxation that is insufficient to raise the temperature of the skin.

"These demonstrations can have but one meaning and conclusion, namely, that the abnormal spasm of the spontaneous attack is produced locally and does not arise out of abnormal vasomotor impulses.

"(c) There is a third demonstration, namely, that the onset of vasomotor paralysis does affect the degree of pre-existing spasm, and that it does tend to prevent the occurrence of spasm not as yet established. These two points must be discussed a little further for they are liable to be misunderstood and to be regarded as in conflict with the previous conclusions, though they are not so in actual fact. The paralysis affects a pre-existing spasm, causing a sufficient relaxation to allow a slow oozing of blood through the vessels of the skin and this slow oozing when the skin is cold is enough to change the color of the skin and to keep it bright red. The striking change from violet to red is no index of a correspondingly profound change in blood-flow. The very slight relaxation occurring is to be expected; it does not provide evidence that the pathological element in the spasm is abolished or even reduced. The tone of the vessels of the finger when in spasm is simultaneously maintained from two sources, namely, by the exaggerated effect of temperature acting locally and by the normal vasoconstrictor tone. It is because it is only a normal vasoconstrictor tone that is abolished that the spasm fails to disappear, though very naturally it is slightly lessened in degree. Though it has not actually happened in our examples, it can readily be conceived that, given just the right conditions, vasomotor paralysis might so tip the balance as to bring vessels from spasm to a more effective relaxation, with consequent rise of temperature. Even so, such an instance would not show that the spasm was determined by vasomotor impulses.

"The second point that vasomotor paralysis tends to prevent the onset of spasm is illustrated by examples 2 and 4, in both of which cooling in air rendered all the fingers cyanotic except those to which the nerve supply was damaged. The same reasoning applies to this as to the last case; and there is a further and important consideration. When relaxation of the blood vessels through vasomotor paralysis has already occurred in a given finger, this finger is kept hotter than is usual by its unusual blood supply, and so subsequent exposure to air has far less effect in cooling this finger than its neighbors."

"There are further comments on this phase of the subject based on some of the earlier operations on the sympathetic ganglia and intervening nerve trunks.

The Rôle of the Vasomotor Nerves

"Our observations upon ulnar nerve anesthesia, and our examination of instances of surgical interference with the vasomotor nerves, lead us to the same conclusions at which we arrived from our observation upon local warming and cooling, namely, that a local fault of the vessels, and not a vasomotor impulse, determines the abnormal condition of spasm that the digital vessels exhibit at relatively low temperatures.

"It is a most important matter that the part played by several factors in bringing about the final state of vascular spasm as we see it, should be weighed carefully, and that the words used in conveying a conception should be chosen deliberately and used and read precisely.

"The statement that a vasomotor impulse does not determine the abnormal condition of spasm is not intended to convey the idea that the vasomotor impulse contributes nothing to the tone of the vessels as it exists. The amount of constriction in the vessels at a given instant will depend upon the vasomotor tone and upon local influences; these will combine and act together. Remove one or the other and the vessels will relax. The fact that anesthetization of the vasomotor nerves causes relaxation of the vessels manifestly means that the vessels were in receipt of vasomotor impulses, but does not implicate the vasomotor nerves as exerting an abnormal influence. Because in certain cases the fingers or toes fail to exhibit attacks of cyanosis subsequent to sympathetic denervation, it may be tempting to conclude that these nerves are responsible for the abnormal element of spasm in the vessels. The conclusion, nevertheless, is fallacious. The abnormal element remains; all that has happened is that a tendency towards vasodilatation has been established by the denervation, and this has concealed what was previously

evident. In searching for the determining cause of spasm, we must review the several possibilities and ascertain whether the abnormality is local or lies at a distance; it will not be found in both. Our conclusion is that the cause is a local cause."

THE LOCAL FAULT

"It has been concluded from observation upon local cooling of the fingers in cases of the type we have defined that an abnormality of the digital arteries exists; this displays itself in hypersensitivity of these vessels to relatively low temperatures. A statement made in this form is preferable to one tending to convey that the fault actually consists in hypersensitivity to cold, since in the severer cases increased tone of the vessels may be present when the temperature of the fingers is raised at least as high as 30°. Further, although the statement of a hypersensitivity to cold might be held to infer that there is an underlying defect in the muscular wall, it is important plainly to point to this probability. There may be other abnormalities of reaction, apart from that to temperature, as yet undiscovered. Conclusion based upon the evidence in the present monograph really ends at the point of implicating the vessel wall. Some evidence has been brought forward which suggests that the fault is only in certain vessels and not in all vessels of the same order. Further evidence along these lines is desirable, owing to its relevance to a question that this monograph does not consider, namely, what causes the vascular defect in the first instance? If it were a general defect, then a general influence, like the circulation of some special product of metabolism, would suit the case; but if it is a fault confined to vessels in given areas, then an influence affecting these areas only must be postulated. These considerations, if followed up at present, would soon become too speculative; they are discussed quite briefly because by so doing the point to which present conclusion is carried becomes sharply defined, and a direction in which further conclusion may be sought is indicated."

RAYNAUD'S DISEASE*

Studies on Post-Operative Cases Bearing on the Etiology of the Disease and the Efficiency of Sympathetic Ganglionectomy

BY JAMES C. WHITE, M.D.†

I. INTRODUCTION

A YEAR ago, the author reported the result of sympathetic ganglionectomy on a series of 23 cases of Raynaud's disease and allied conditions of poor circulation in the extremities operated upon by various members of the Peripheral Vascular Clinic[1]. The follow-up data on which this report was based were gathered over periods of from 1 to 22 months after operation. The results in the cases of simple Raynaud's disease at the time of this report were uniformly good. All of this group of patients have been extremely coöperative and in every instance except one it has been possible to make frequent and thorough follow-up examinations. As a result of these, it has become obvious during the past year that some of the statements in the preliminary report were too enthusiastic. The present report comprises 6 cases which seem most definitely to fall into the classification of Raynaud's disease. These patients have now been followed over periods of from 9 to 34 months, so with Sir Thomas Lewis here we have an ideal opportunity to go over them in a critical way.

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II. DEFINITION

Before proceeding to the discussion of these cases we must explain exactly what we mean by Raynaud's disease, as the term has been loosely applied in the past to cover a great variety of circulatory disorders. The following definition has been drawn up by the Circulatory Clinic of the Massachusetts General Hospital:

"Raynaud's disease is a form of peripheral vascular disturbance caused by tonic contraction of the smaller arteries in the extremities without obvious pathological changes in their walls. It commonly involves symmetrical areas in the hands or feet causing excessive perspiration and circulatory stasis with periods of cyanosis or pallid asphyxia. The severe cases go on to dry gangrene of the phalanges. The spasm is intermittent and occurs on exposure to cold or emotional stimuli; it involves only the terminal arteries, while the main vessels continue their normal pulsations. The disease most commonly occurs in young individuals with hyperirritable nervous constitutions."

In our clinic we have heretofore felt that Raynaud's explanation of the etiology of the disease was correct. We have felt that the attacks of symmetrical cyanosis and pallid asphyxia are due to a hyperactive vasomotor tone mediated by the sympathetic nervous system. This same mechanism also produces excessive

activity of the sweat glands. Lewis[2], after a series of exceedingly interesting and careful observations, has concluded that the underlying cause of the poor circulation in Raynaud's disease is not an excessive vasoconstrictor tone, but a local fault in the smooth muscle of the arterioles. He feels certain that the digital arterioles themselves are hypersensitive to cold and become abnormally contracted from local chilling. In this state normal variations in vasomotor tone are sufficient to produce all the changes seen in Raynaud's disease. Lewis bases these conclusions on observations made on relatively advanced cases. It has been our feeling that the disease starts as a pure vasomotor neurosis, but that after a prolonged period of resulting circulatory stasis, secondary changes take place in and around the digital arterioles which produce the local picture described by Lewis.

The purpose of this paper will be to evaluate the effects of operation in our cases and to try to determine whether the good and the bad results can best be accounted for on the basis of excessive vasoconstrictor tone or a local increase in tone in the smooth muscle of the arterial walls.

In order to simplify the discussion, only the 6 cases which most directly fulfill the criteria of Raynaud's disease defined above have been selected for analysis.

III. METHOD OF STUDY

A. *Preoperative Tests*

In all the cases discussed in this report the following preliminary tests have been carried out to determine whether the interruption of the sympathetic nerves would cause a restoration of normal circulation:

1. *Novocaine block of sympathetic nerves.* We feel that this is the most important test to evaluate the benefit of sympathectomy, because by suitable methods of injection the vasoconstrictor nerves can be blocked either in the spinal cord, or in the paravertebral ganglionated trunk, or in the main peripheral nerves of the extremities. These injections give a temporary increase in circulation which is exactly comparable to that produced by the operative removal of the vasoconstrictor fibres running in the sympathetic nervous system.

2. *Foreign protein shock.* The intravenous injection of a dose of typhoid vaccine containing 50 million bacilli also gives a marked increase in the peripheral temperature in cases of Raynaud's disease, but only a very slight response in mechanically occluded arteries. We feel that this test is a qualitative rather than a quantitative one, but if properly carried out, it gives a fairly accurate estimate of the value of sympathectomy.

3. *Observation of the capillaries.* Direct observation of the capillaries with a capillary microscope has been of considerable value to us in studying these cases. In Raynaud's disease the number of capillaries is normal, but many of them are dilated or misshapen in form and the rate of circulation through them shows marked fluctuation. We have been particularly interested in noting the effect of psychic changes on the flow through the capillaries. In normal patients emotional changes are hardly noticeable, but in some of this group with Raynaud's disease extraordinary fluctuations have taken place. The mere opening of a door or a stranger's coming into the room may cause the circulation in the capillary loops to come to a complete standstill. We have felt that this type of case is peculiarly suitable for sympathectomy.

4. *Degree of sweating.* The distribution and degree of sweating have been accurately noted in these cases and it has been found to be a characteristic sign of Raynaud's disease that sweating in the hands and feet is greatly increased. The sweating is not only constantly exaggerated, but is usually present in the cold, and emotional changes may bring it out in an extraordinary degree. Evaporation of this excessive perspiration may cause a chilling of the extremity to as much as 6°F. below room temperature. Such cases react very favorably to sympathectomy.

B. *Postoperative Tests*

The above preoperative tests have also been used to determine the completeness of interruption of the sympathetic nerves. In a completely desympathectomized extremity novocaine block and intravenous typhoid vaccine should give no further rise in surface temperature*. The circulation through the capillaries should be constantly at a maximum and should show no variations with the emotions of the individual. Sweating and gooseflesh should be completely absent.

We have been watching developments in these cases with great interest. If Lewis' theory is correct, it would seem that any imperfect results should be apparent early after the operation. This is true in the last two cases which Lewis and Landis report[3], in spite of the fact that the sympathetic pathways to the hand appear to have been effectively cut. If, on the other hand, the operated extremity should remain completely warm and dry for a period of several months (as reported in our previous paper), and then there should be a slow recurrence of coldness and color changes, along with increasingly exaggerated sweating, another ex-

*The writer is indebted to Dr. F. Fremont-Smith for the suggestion of following the foreign protein reaction with simultaneous observations on the rate of blood flow through the capillaries and surface temperatures, as well as for his assistance in carrying out a number of these observations. This has greatly enhanced the value of the test.

planation should be searched for. Under these circumstances one may assume either a regeneration of the divided nerves or the persistence of a few sympathetic fibres which were missed at operation and have gradually taken on an increasingly active function.

Let us examine our cases and decide what has taken place.

IV. CASES*

CASE 1. *Elsie McE., aged 14 (M. G. H. No. 295113),* had suffered from "chilblains" since infancy. She was unable to remember when she did not have color changes and coldness of her hands and feet. Aside from these complaints, she had always been well. Five years before admission, the skin of her finger tips became "raw and sore". At the same time her nails became thicker and after two years she

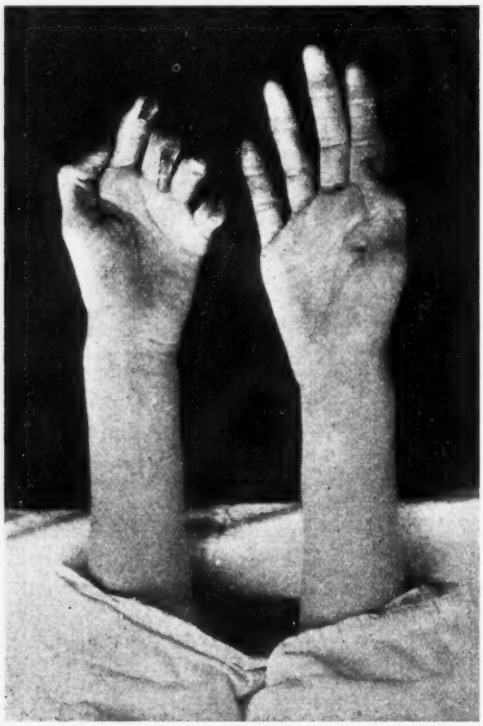


FIGURE 1.

Hands in Case 1, showing trophic changes in the nails and ulceration of finger tips.

stopped cutting them entirely because they became too tender. During this time her fingers became stiff and drawn so that extension became impossible. In the past two years she noted that "water-blisters" developed on her hands and feet. These would break and leave a raw area of new skin. She stated that when cold, her hands and feet, which were always redder than normal, became first blue and then white. Her father, brother, two sisters, and paternal grandmother all had similar but less marked changes.

The actual condition of the hands is well shown in Fig. 1. All hues of color from normal through complete pallor to deep, dusky blue were noted. The toes showed less marked color changes and no ulceration. The skin temperature measurements showed the fingers and toes to be slightly colder than the room.

*The operations reported in these cases have been performed by the following members of the Circulatory Clinic: Doctors Allen, McKittrick, Smithwick, Faxon, and White.

Operation, January 19, 1929: Resection of first and second dorsal ganglia on left side. In performing this operation, the technic first described by Adson[4] was used. This consisted in the resection of the proximal inch of the second rib with its transverse process and the extrapleural exposure of the upper dorsal ganglia. In Adson's words: "After the second thoracic ganglion has been elevated, and the sympathetic trunk has been divided below, traction on the sympathetic trunk is now made from above downward, thus exposing the cervicothoracic ganglion. This exposure is done by first dividing the rami as they pass off to the first thoracic spinal nerve. These maneuvers permit gradual mobilization of the ganglia of the thoracic chain and finally retraction of the cervicothoracic ganglion sufficiently to divide all of the rami ascending from the ganglia into the cervical region."

In this case it was impossible to pull down more than the entire first dorsal ganglion, as the inferior cervical portion of the stellate ganglion lay a full centimeter higher up and above the first rib. Contrary to the usual anatomical illustrations of the stellate ganglion as a single fused structure (see Adson's article), it has been our observation that the inferior cervical and first dorsal components are large distinct entities, which are usually separated by an intervening centimeter of sympathetic trunk. (Fig. 2b.) As the resection of the two upper dorsal ganglia alone produced a complete regional sympathetic paralysis in this case, neurectomy was limited to these two ganglia in all of our earlier cases described in this article.

In order to be sure of removing the inferior cervical portion of the stellate ganglion we have found it usually necessary to remove the first rib. Adson[5] has recently come to the same conclusion and feels that when the inferior cervical component is left behind, the vasomotor paralysis is often incomplete. He now recommends a first rib approach to facilitate a complete resection from the inferior cervical to the second dorsal ganglia. We had reached a similar opinion about the time this article appeared, but not early enough to affect the handling of the cases which are concerned in this report.

The patient made an uneventful postoperative convalescence and subsequently submitted to amputation of the atrophied finger tips. These healed well. Following operation the temperature of the left thumb rose to 90°, the other fingers which showed marked atrophy and sclerodermatous changes, to 80°. The patient lives at too great a distance for follow-up examination, but writes that at the end of 34 months there has been no recurrence of sweating, color changes, or other symptoms. The skin of the operated fingers has remained healed and there has been no advance of the disease in the other extremities.

CASE 2. *Loretta H., aged 25 (M. G. H. No. 309534),* was a thin, ptotic, nervous young stenographer. During the past three and a half years she had noted that the fingers became pale white, numb, and painful to the knuckles on exposure to cold or on emotion. Both hands perspired very profusely. Last winter her feet also became involved, but to a lesser degree. She had also noted slight but definite arthritic and sclerodermatous changes in the skin of her fingers, which made her typing extremely difficult. Examination showed that her fingers, which were always slightly cyanotic and sweaty, varied on exposure to cold from deep purplish blue to complete pallor. Intravenous foreign protein injection gave such a good response that novocaine injection was considered unnecessary. (Chart 1.)

Operation October 30, 1930: Resection of first and second left dorsal sympathetic ganglia. (Fig. 2a.) The patient made a good convalescence and was discharged from the hospital in two weeks. At the time

of her discharge no color changes could be induced in the operated hand, which was hot and dry.

The patient was next seen four months later, when she came in for sympathetic ganglionectomy on the right side. At this time the left hand had remained continuously warm and dry and showed a

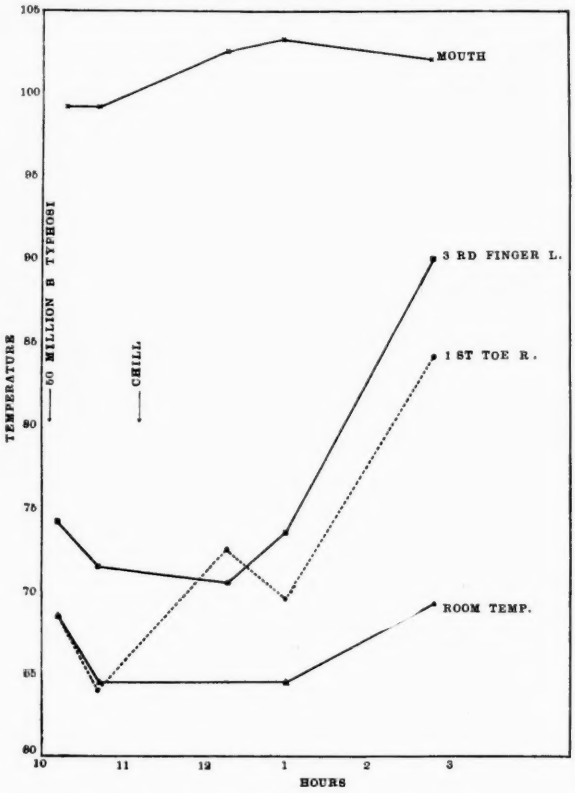


CHART 1.

Foreign protein reaction in Case 2 before operation. This exhibits a typically favorable response in an early case of Raynaud's disease.

most extraordinary increase in growth of the fingernails. (Fig. 3.) The response to sweating showed a very effective degree of sympathetic nerve interruption. (Diagram 1.) Observations of skin tem-

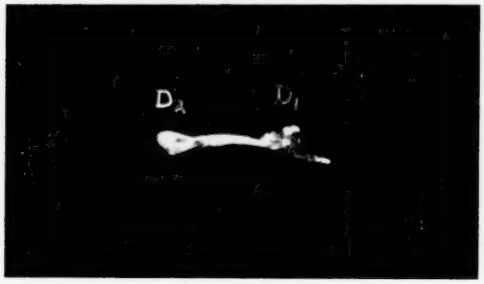


FIGURE 2a.

Specimen of 1st and 2nd dorsal ganglia removed in first operation on Case 2.

perature changes and capillary flow following injection of foreign protein showed a constant maximal flow through the capillaries on the operated side and the characteristic variations of flow on the unoperated side. (Chart 2.)

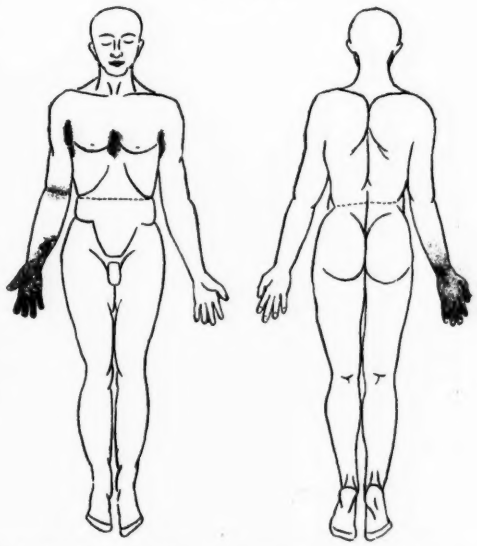
Operation; February 27, 1931: Resection of right inferior cervical, first and second dorsal ganglia. (Fig. 2b.) The patient recovered rapidly from this operation, but complained a good deal of the marked drooping of her upper eyelid. It has been a constant observation on our cases that when the operation is not carried above the first dorsal ganglion, very little drooping of the eyelid occurs. The slight droop, with moderate narrowing of the pupil and enophthalmos, disappears within a few weeks. When, however, the inferior cervical ganglion is removed, a complete Horner's syndrome invariably develops and remains more or less permanently. After a

FIGURE 3.

Photograph taken 3 weeks after the patient (Case 2) cut the finger nails of her two hands equally. Note the tremendous increase of nail growth in the left hand after restoration of adequate circulation by sympathectomy.

unilateral operation it is quite disfiguring. This is one of the reasons why we have avoided resection of the inferior cervical ganglion. The patient was recently seen nine months after this last operation. Both hands have remained perfectly dry and nor-

DIAGRAM 1.
Loretta H.



Distribution of sweating in arms 4 months after excision of D_1 and D_2 left. Case 2.

mally warm. No evidence of vasospasm could be produced even after a ten-minute exposure out-of-doors when the thermometer was at 55°.

CASE 3. *Phyllis B., aged 29 (M. G. H. No. 305964),* a very nervous and poorly developed young Italian, states that as long as 14 years ago, while still living in Naples, she noticed that the middle finger of her right hand became cold when she went out-of-doors in cold weather, put her hand in cold water, or became nervous or frightened. The process spread until all her fingers and toes became involved. In a

typical attack the fingers became suddenly white and numb on exposure to cold. In about five minutes the color changed to a deep purple and the numbness became less marked. From purple the fingers became fiery red, hot, and tingling. After these phases the hands became normal again. The usual length of

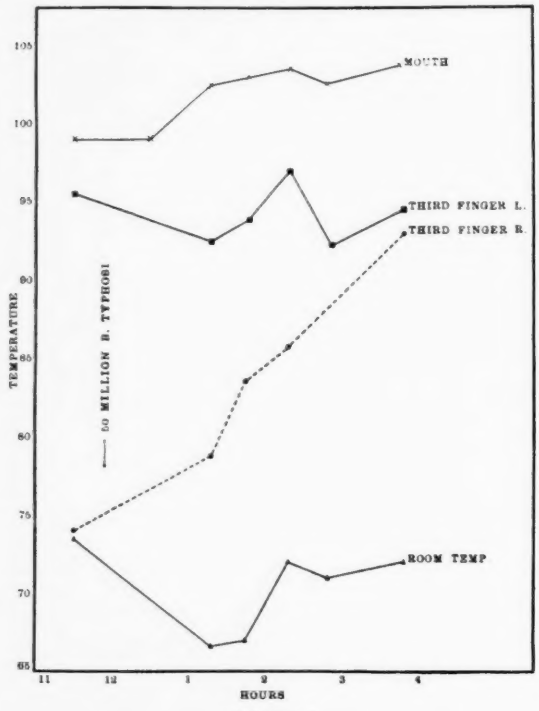


CHART 2.

Response to foreign protein shock after complete interruption of sympathetic fibres to the left arm. Case 2.

The desympathectomized arm shows a uniform maximum circulation throughout the febrile reaction.

The unoperated right arm shows complete circulatory stasis in the beginning with a rise to maximal circulation at the height of the fever.

the attacks was about ten minutes, but occasionally they lasted much longer. When she went in bathing in cold water, her tongue reacted in the same way. In recent years the hands have become constantly cold and clammy, with attacks as described above on exposure to cold. One year ago she devel-

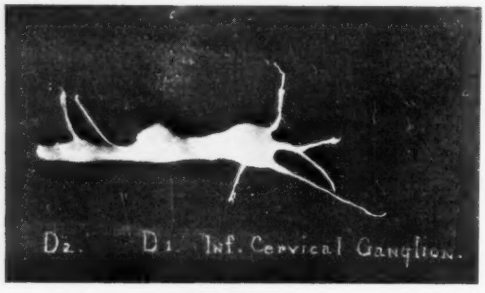


FIGURE 2b.

Specimen of inferior cervical, 1st and 2nd dorsal ganglia removed at 2nd operation.

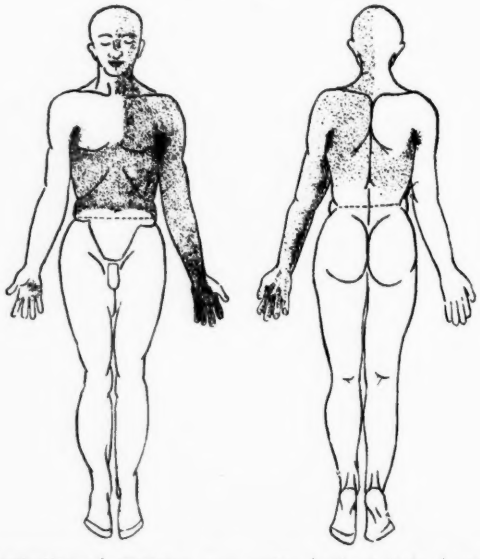
oped pain under the nail of her right index finger and the skin peeled off. The pain in this finger became very severe. Four months before admission a similar pain occurred in her right middle finger and two weeks ago in the right ring finger. Although at first the blanching occurred only in the fingers, in the past ten years the hands have been involved as high as the wrists. The feet have remained only slightly affected.

Operation, April 18, 1930: Gas oxygen anesthesia; resection of first and second dorsal sympathetic ganglia, right side. The patient made a smooth and uneventful recovery and left the hospital on the twelfth day.

At the time of her discharge it was impossible to induce sweating on the operated side, although the unoperated side continued to perspire profusely. The two hands presented a most striking appearance, the right being slightly pale but totally free from any color changes and continually over 90°, the left showing continuous cyanosis with periods of pallid asphyxia in the finger tips brought on by lowering the room temperature below 70° or by any psychic disturbance. She herself felt that the right hand was completely cured and observed that the right side of her tongue was now normal, whereas the left felt distinctly cold when she was chilled.

Eight months later the patient reported for examination. The right hand remained completely warm and dry. On exposure to heat in an electrically heated chamber only slight perspiration could be made out in the palm of the right hand. (Diagram 2.)

DIAGRAM 2.
Phyllis B.



Distribution of sweating over upper half of body 8 months after resection of D_1 and D_2. Case 3.

The temperature of the hand remained over 90° and no color changes could be made out. The symptoms in the unoperated hand had slightly increased in severity, while her feet troubled her very little. At this time she was given an intravenous injection of 45 million typhoid bacilli. (Chart 3.) At the beginning of the experiment the temperature of the right hand was 20° warmer than the unoperated left side. Observation of the capillaries showed a maximum circulation on the right and a very poor circulation on the left, with complete stasis when a number of students came in to observe her. As the mouth temperature rose and the patient felt chilly, the circulation on the right remained rapid, while on the left there was complete stasis. As the fever reached its height, the circulation on the right continued unchanged, whereas the loops on the left showed a sudden dilatation and a very rapid flow. The skin temperatures on the right merely followed the mouth temperature, whereas on the left there were marked changes, as shown in the chart. From these observations and a nearly total absence of sweating on the right side we may conclude that the sympathetic vasomotor and sweat fibres re

mained quite completely interrupted on the right side at the end of 8 months. On the left side there was considerable evidence in favor of hyperactive vasomotor tone with exaggerated responses to psychic stimuli and to foreign protein shock.

In October, 1931, 18 months after operation, the patient returned again for check-up. Since her previous admission a marked recurrence of her old symptoms has taken place on the operated side. She states that the color changes in her right hand have recurred during the past few months so that they are now almost as marked as before her operation. The condition of the feet has not changed. The patient has recently been under the charge of a psychoanalyst, with considerable benefit to her nervousness, and feels willing to have another operation if it is indicated. As this patient was very carefully studied 8 months after operation, when the result in her operated hand still appeared to be perfect, she now presents an excellent opportunity to determine what changes have taken place to cause this delayed recurrence of Raynaud's disease. If a local fault in the smooth muscle of her digital arterioles is solely responsible for her trouble, then it would seem as though the poor results should have been manifest from the start. Can we demonstrate a return of excessive vasomotor activity in the operated extremity and is this the harmful factor? The following findings indicate this to be the case:

1. *Sweating tests:* At the postoperative examination described above sweating was entirely absent in the right arm. Eight months after operation there was slight but definite sweating in the palm of the hand. Now there is a normal amount of sweating over the entire arm and profuse sweating in the hand, which perspires nearly as much as the left. (See Diagram 2.)

2. *Gooseflesh:* The patient on several occasions has shown gooseflesh equal in distribution over both forearms. This also shows the presence of sympathetic nerve activity.

3. *Response to foreign protein shock:* Eight months after operation, when this test was done, the maximal rate of blood flow continued throughout the experiment in the right hand, whereas the left showed marked fluctuations from complete stasis in the chill stage to maximal circulation through the capillaries during defervescence. Now, 18 months after operation, she shows identical changes in the two hands with a variation from complete capillary stasis, color changes, and coldness in the fingers at the start to a restoration of normal circulation. (Chart 4.)

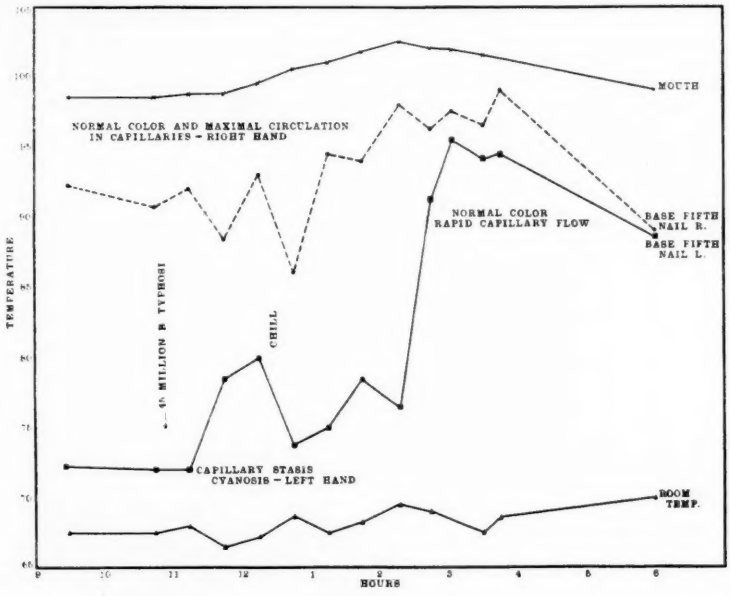
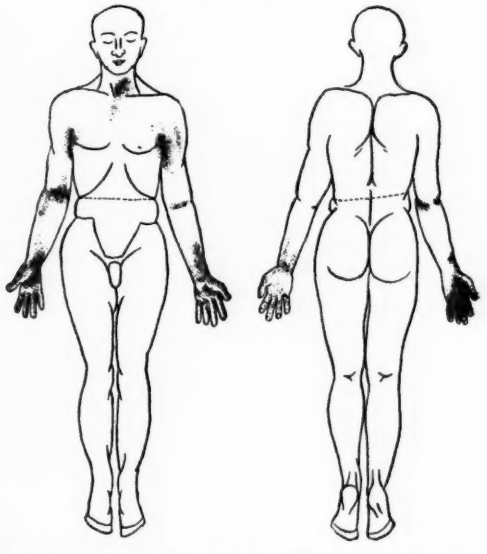


CHART 3.

Foreign protein reaction in Case 3 at 8 months after operation. The steady rapid capillary flow in the desympathectomized right side indicates a complete vasomotor paralysis. Contrast this with the fluctuating circulation on the left where the vasomotor nerves are intact.

DIAGRAM 3.
Phyllis B.



Distribution of sweating in arms 17 months after resection of D_1 and D_2. Case 3.

4. *Novocaine tests:* With the patient in a room at 66° the finger tips in both hands were mildly cyanotic and showed an average temperature of 74°.

(Table 1.) The median and radial nerves on the right (operated) side were injected at the elbow with 2 per cent novocaine, causing complete anesthesia of the corresponding area in the hand. The thumb temperature promptly rose 12°. The cyanosis disappeared. The index finger warmed very slightly and the other three fingers showed no increase in temperature*. Three-quarters of an hour later the ulnar nerve was injected at the wrist and in twenty minutes the temperature of the remaining fingers had risen to between 89° and 92°. The fingers on the right hand were now 20° warmer than those on the left and a bright pink in color, whereas the ones on the left showed a moderately deep cyanosis. The patient was taken, lightly clad, out-of-doors for 15 minutes at a temperature of 60° and then had both hands immersed in water at 58°. This exposure failed to bring on the slightest color change in the hand where the vasomotor fibres were blocked with novocaine, although very pronounced changes were apparent on the opposite side.

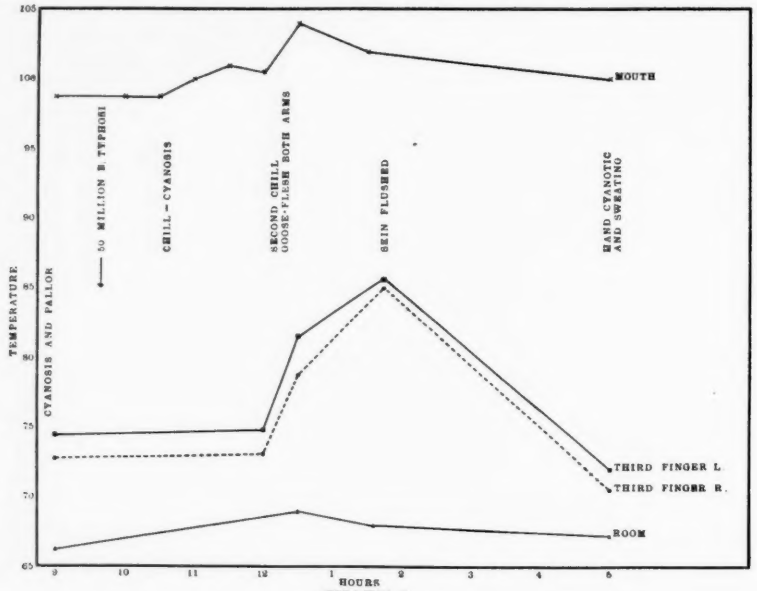


CHART 4.

The same case 18 months after operation. The operated side now shows the fluctuations in blood flow which are characteristic of an active vasomotor tone.

*These figures prove that the distribution of the vasomotor nerves in the hand does not correspond exactly with the sensory innervation. It may also explain why Lewis' patients, after novocaine block of the ulnar nerve at the elbow, showed a persistence of color changes in the little finger and a rise in its temperature to only 85°. In our less severe cases where the ulnar nerve alone was blocked, the temperature rise in the little finger was incomplete. When the median nerve was subsequently infiltrated or when the upper dorsal ganglia were injected paravertebrally, the temperatures rose to over 90° and no color changes could be induced in any of the anesthetized fingers.

This test gives an even better indication than foreign protein shock of the importance of vasoconstrictor impulses in bringing on arteriolar spasm with coldness and color changes. It is of the greatest interest to note that after a postoperative recurrence the secondary block with novocaine is capable of again bringing on a complete remission. It seems fair to assume that if vasoconstrictor tone could be completely abolished, this patient would have permanent relief from all her symptoms.

This case is taken up in detail because it has been followed with greater care than any of the others and throws considerable light on the physiological processes which underlie Raynaud's disease and cause a recurrence of symptoms after sympathectomy. To save time and

TABLE 1

CASE 3

	2:30 Blocked Median and Radial Nerves at Right Elbow		3:10 Total Anesthesia of Median and Radial Nerves		3:15 Injected Ulnar Nerve at Wrist	3:35 Complete Anesthesia of Hand	
	R.	L.	R.	L.		R	L.
Finger 1	75.0	77	86.9	74.3		88.7	73.4
" 3	74.3	77	78.8	73.4		89.6	71.6
" 5	72.5	77	77	73.4		92.3	71.6
Room T.	66°		67°			65°	
Finger 1	Cyanosis +	+	Pink	+		Pink	Pallor and Cyanosis
" 3	" +	+	Cyanosis +	+		"	" " "
" 5	" ++	+	" ++	+		"	" " "

4:00 Patient was taken out of doors, lightly clad, at temperature of 60° for 15 minutes. This produced no change in color of right hand, but marked cyanosis of left. Immersion of hands in water at 58° for 10 minutes produced no further change.

4:30 Anesthesia wearing off and temperature of right fingers falling.

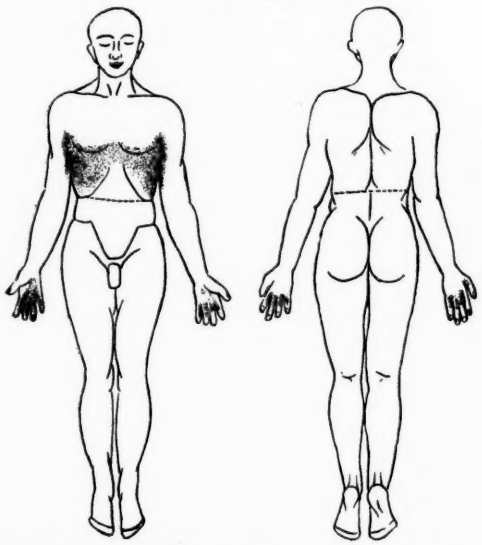
avoid useless repetition, the following cases must be taken up in less detail:

CASE 4. *Sister Labré, aged 38 (B. M. No. 273)*, a French Canadian nun, had suffered from typical Raynaud's disease for two years. She showed constant slight cyanosis of the fingers in both hands, with superimposed intense vascular crises brought on by any exposure to cold. These spasms lasted about fifteen minutes, during which time the fingers showed color changes varying from complete pallor to a deep purple hue. During the previous winter patches of gangrene had appeared in the tips of all the fingers except the thumbs. These had healed during the summer, but had reappeared at the time of her admission. The fingers during the attacks were very painful. There were also sclerodermatous changes, so that she was incapable of sewing or making any fine movement. Both hands showed excessive perspiration. Her feet were not involved. Intravenous typhoid vaccine gave an excellent temperature response and the superficial ulceration of the finger tips healed temporarily.

Operation, June 22, 1930: Bilateral sympathetic ganglionectomy, first and second dorsal right, second and third dorsal left*. The patient made an uneventful convalescence and was discharged from the hospital in eleven days.

At the time of her discharge the thumbs, index

DIAGRAM 4.
Sister Labré.



Distribution of sweating in arms 10 months after excision of D_2 and D_3 left, D_1 and D_2 right. Case 4.

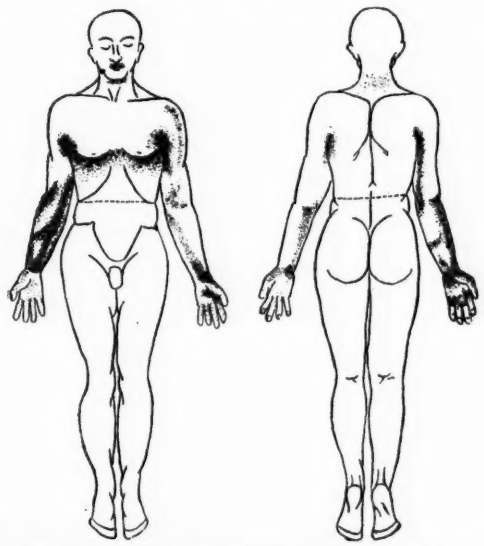
and little fingers of both hands showed maximal circulation, but the middle and ring fingers on the left and the ring finger on the right continued to be cool and show slight color changes. These were the fingers that showed most marked ulcerative and sclerodermatous changes, so that it is quite possible that the digital arteries were compressed in a constricting scar.

When seen, five months later, all the ulcerated finger tips had healed and the fingers had become considerably more supple, so that she could sew and make fine movements, which had been impossible before operation. As she sat by an open window at a temperature of 69° her right hand remained hot. The left also was hot, except for the tips of the third and fourth fingers, which were slightly cyanotic and cool.

She was next seen ten months after operation, with a partial recurrence of symptoms. At 60° both hands were cold, the fingers were markedly cyanotic, and the tip of the fourth right finger was ulcerated. Moderate perspiration was visible in both hands. (Diagram 4.)

Sixteen months after operation she showed a complete recurrence of all her old symptoms. The tips of the third and fourth right fingers were ulcerated, her hands cold, blue, and perspiring freely. (Diagram 5.) Intravenous injection of 50 million killed

DIAGRAM 5.
Sister Labré.



Distribution of sweating in arms 16 months after excision of D_2 and D_3 left, D_1 and D_2 right. Case 4.

typhoid organisms brought about the marked rise in skin temperature of the fingers (Chart 5), which is characteristically present in Raynaud's cases with an intact vasomotor system. Novocaine injection of the median, ulnar, and radial nerves at the left elbow also caused a satisfactory warming of the hand and a return to normal color of the deeply cyanosed fingers. (Table 2.) The evidence in this, as in the preceding case, points to a recurrence of symptoms coinciding with a regeneration of sympathetic tone. Because of the severe symptoms leading to gangrene of the finger tips of the patient's left hand and the favorable test injection with novocaine, it was decided to attempt a secondary operation on this side.

Operation, October 29, 1931: As the previous operation on the left had been carried out through the third rib, it was possible to remove portions of the first and second and strip the pleura off the sides of the vertebrae without much interference from scar tissue. Normal appearing inferior cervical and first dorsal ganglia were found and resected, dividing the trunk beneath the lower ganglion, where it ended in a dense mass of scar tissue at the upper limit of the previous operation. Convalescence was uneventful.

This secondary operation confirmed the predictions of the test injection of novocaine. (Table 2.) It is again impossible to produce any sweating in this extremity and the increase in temperature of the fingers is most satisfactory. The advanced scleroderma prevents a complete restoration of normal circulation, but if the present condition is maintained, her most troublesome symptoms should be permanently relieved. While the permanence of this op-

*In three cases in which this operation was done bilaterally the second and third dorsal segments were removed on one side, because Langley had shown that in dogs and cats the highest vasoconstrictor fibres leave the cord at the third dorsal level. It was felt that if this were true, the lower operation would be equally effective and that its technique would be simpler. In all three of these cases there has been a recurrence of symptoms, but the recurrence has been no worse on the side on which the lower operation was performed.

eration cannot be determined for many months, the final result in this case should show whether it is always necessary to remove the inferior cervical as well as the upper two dorsal ganglia or whether no known operative procedure can be counted on to produce invariably a permanent and complete sympathetic paralysis of the arm.

The patient made a good recovery and the ulcers promptly healed and have remained so ever since. Both legs have remained completely free of perspiration below the mid thigh (Diagram 6) and the temperature of the toes at the end of two years

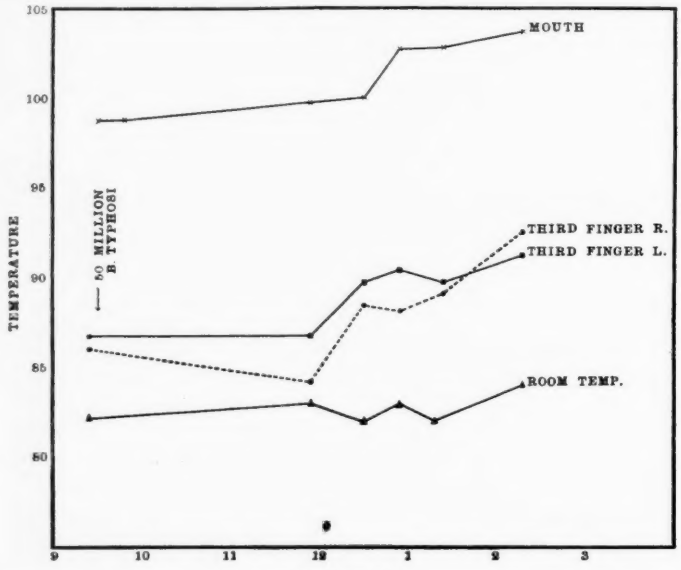


CHART 5.

Case 4 at 16 months after operation and with a severe recurrence of symptoms. The fingers in both hands show the marked fluctuations of temperature during the febrile reaction which denote a regeneration of vasomotor tone. (If the room had been colder, the thermal response of the finger tips to fever would have been even more striking.)

Case 5. *Charlotte H., aged 26 (M. G. H. No. 302794).* In this case, although the chief complaint consisted of intractable ulceration of both lower legs diagnosed erythema induratum, yet there was an antecedent history typical of Raynaud's crises in the feet. She said that for years her fingers and toes became numb when exposed to cold and that with the numbness she noted periods of blanching and cyanosis in the distal half of the feet. At room temperature of 73° the tips of her toes were at 76°. Administration of spinal anesthesia caused a rise to 96.6° in surface temperature.

Operation, November 19, 1929: Bilateral excision of second, third, and fourth lumbar sympathetic ganglia.

The patient made a good recovery and the ulcers promptly healed and have remained so ever since. Both legs have remained completely free of perspiration below the mid thigh (Diagram 6) and the temperature of the toes at the end of two years remains over 90°. The hands show a marked contrast, being cold, clammy, and slightly cyanotic at a room temperature of 70°. The difference eleven months after the sympathectomy between the responses to foreign protein shock in the toes and in the unoperated hands is graphically shown in Chart 6. The toes show a maximal circulation throughout, whereas the fingers, which showed complete circulatory stasis before injection, developed a maximal circulation only during the height of the fever.

TABLE 2

CASE 4

		Novocaine block of Ulnar, Median and Radial Nerves at left elbow				5 days after 2nd operation	
		Before		After			
		R.	L.	R.	L.	R.	L.
Finger 1		75.2	73.4	75.2	89.6	76.1	87.8
" 3		70.7	71.6	73.4	83.3	74.3	83.3
" 5		71.6	72.5	73.4	82.9	74.3	83.3
Room T.		63°		65°		66°	
Finger 1	Cyanosis	Pink	+	Pallid	Pink	Pallid	Pink
" 3	"	++	++	+++	"	+++	"
" 5	"	++	++	++	"	+++	"

It is interesting to note that in every instance (12 cases) in which lumbar sympathectomy has been carried out for Raynaud's disease or in allied conditions, there has been no evidence of regeneration of sympathetic tone.

Case 6. *Louise T., aged 46 (M. G. H. No. 298027).*

Three years ago, this patient noticed the beginning of color and temperature changes in the fourth and fifth fingers of her left hand at their tips. Since then both hands and feet have become progressively

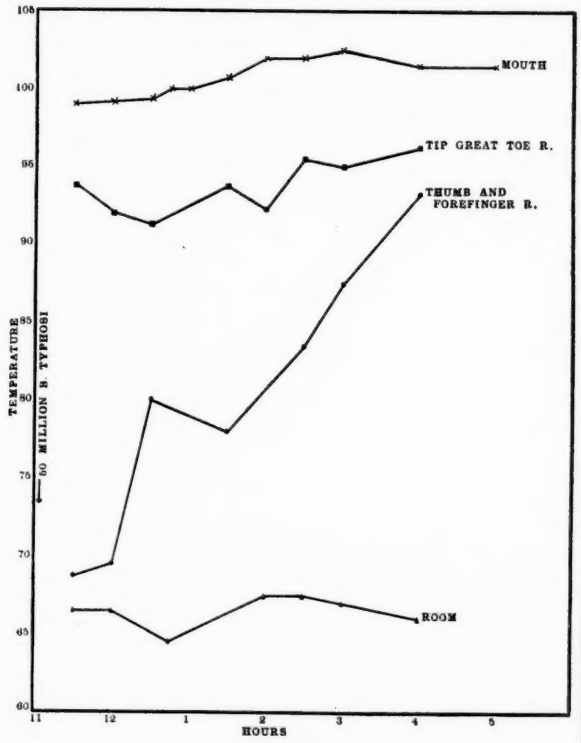
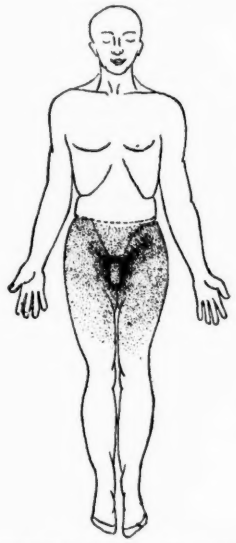


CHART 6.

Response to foreign protein shock in Case 5, 11 months after lumbar ganglionectomy. The absence of thermal fluctuation in the toe is typical of a degenerated vasomotor system, whereas the reaction in the fingers is characteristic of a hyperfunctioning one.

involved. The hands and feet on exposure to cold show blanching of the phalanges and in the cyanotic stage discoloration as high as the wrists and ankles. The hands and feet are continually cold and clammy. For the past fifteen years she has noticed

DIAGRAM 6.
Charlotte H.



Distribution of sweating in legs 23 months after bilateral excision L_2-L_4. Case 5.

superficial ulcerations on the ankles in the summer time. These used to go away with the advent of cold weather, but during the past year have become worse and the skin on the dorsal surface of the feet has been slowly converted into dense scar tissue, which easily breaks down and ulcerates. During the past winter she has noticed cracking and small ulcerations on the tips of all her fingers. These clear up in warm weather. Cold water causes burning, blanching, and numbness of the hands followed by cyanosis and redness with prickling and stinging sensations. Any kind of excitement tends to produce these same phenomena. On examination the tip of the right ring finger and several patches of skin on her feet were ulcerated. These lesions are shown in Figure 4.

The patient was first tested with intravenous typhoid vaccine, which gave an inconclusive reaction, in spite of a severe chill and temperature of 104°. Paravertebral dorsal novocaine injection of the first and second dorsal ganglia, however, caused a maximum elevation of surface temperature of the thumb, but showed that the arteries in the sclerosed digits were only partially dilatable.

Operations: Right lumbar ganglionectomy, April 17, 1929. Left lumbar ganglionectomy, April 29, 1929. These operations were done separately because at the first stage an acutely inflamed gallbladder full of stones was found and it was thought best to remove it rather than do a sympathectomy on the left side. December 31, 1929: Excision of right second dorsal ganglion and a portion of the upper sympathetic trunk with the lower portion of first dorsal ganglion. January 15, 1930: Excision of first and second left dorsal ganglia.

The patient recovered smoothly from all these operations. There was immediate warming and cessation of perspiration in all the extremities. The tips of the phalanges which were not involved in scar tissue registered over 90°, but in others where scleroderma was marked, there was a much lesser increase in temperature. The tips of the fourth and fifth fingers of the right hand had to be amputated on account of the dry gangrene which had developed before her dorsal sympathectomies.

The patient has been frequently seen in the follow-up clinic, the last time two years after the leg operations and fifteen months after the dorsal sympathectomies. At this time the temperature of the toes averaged 88° and the fingers 85° at a room temperature of 73.6°. It was impossible to induce perspiration in any of the extremities. (See Diagram 7.) The hands had given almost no trouble, but slight color changes could be induced when the room temperature was lowered to below 70°. The same was true in the feet and she continued to be slightly troubled by intermittent superficial ulcerations in the scarred areas over her ankles.

In this patient sympathetic denervation appears to have remained complete. While progression of the disease appears to have been checked in the hands and considerably improved in the feet, yet slight but definite color changes are present in all four extremities and the skin temperature in the most fibrosed areas continues to be low and the feet have continued to ulcerate. It appears, therefore, that her present trouble is due to a local fault secondary to her long continued sepsis and ulceration, a condition which corresponds to the picture described by Lewis. We have never observed these local vascular changes in an early uncomplicated case of Raynaud's disease.

V. DISCUSSION

All but two of the patients whose cases are detailed above feel that they were completely relieved of vasospasm during the first months

that followed their operations. In Case 6, and to a much lesser extent in Case 4, where there was only partial improvement, there was such marked scarring and fibrosis of the extremities that the terminal arteries were mechanically occluded in a constricting web of scar tissue. It is now commonly conceded that in such advanced cases one cannot hope for a complete restoration of circulation and that the fault in these terminal stages is undoubtedly a local one. In the other less advanced cases, no evidence of vasospasm could be made out during the patient's stay in the hospital. While it is freely admitted that our methods for demonstrating vasospasm have been less refined than Lewis'*, yet the warm, dry, pink skin of the operated extremity was in striking contrast to the cold, moist, cyanotic unoperated one. Emotional upsets no longer caused vasospasm. The postoperative sweating tests showed only vestiges of perspiration in Cases 4 and 6, and total absence of nerve connections with the sweat glands in Cases 2, 3, and 5. Direct observation of the capillaries during a febrile reaction demonstrated complete paralysis of the vasoconstrictor nerves in all the cases tested. In Cases 1, 2, and 5 these changes appear to be permanent and coincidentally these patients have remained free of the symptoms of Raynaud's disease. In Cases 3 and 4, there are unfortunately clear-cut postoperative recurrences. Lewis[2, 3] has predicted that the surgical treatment of Raynaud's disease will be frequently unsatisfactory, because, according to his theory, the entire pathology lies in the smooth muscle of the arterioles. While he concedes that the removal of normal vasoconstrictor impulses will bring about an increase in peripheral blood supply and thereby improve the condition of the extremity, yet he doubts that this can prevent partial asphyxia of the fingers in the presence of local chilling.

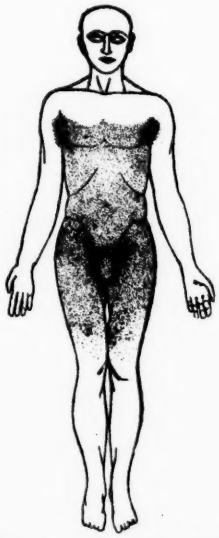
FIGURE 4.
Ulcerative changes in hands and feet of Case 6.

The studies detailed above have convinced us that vasomotor tone plays a most important rôle. In the early cases it is even doubtful

*These tests were carried out by total immersion of the extremity in water at around 60°F. (15°C.) or by placing the patient in a room at 60° to 65° with the lower arms or legs exposed.

whether any evidence of vasospasm can be reproduced in the presence of a complete vasomotor paralysis. (Cases 2, 3, and 5.) In the two late postoperative failures, it is quite clear that sympathetic fibres to the blood vessels, sweat glands, and erector pylae muscles were regenerating at the time of the recurrence of symptoms and that the severity of the attacks increased

DIAGRAM 7.
Louise T.



Distribution of sweating over entire body 11 months after excision of D_2 right and lower portion D_1 right, D_1 and $_2$ left, 20 months after excision of L_2-L_4.

in direct proportion to the return of sympathetic nerve activity. Re-interruption of these fibres with novocaine, and in Case 4 by a second operation, has again temporarily removed all the manifestations of the disease in Case 3 and brought about a striking improvement in the sclerodermatous fingers of Case 4.

If local spasm in the digital vessels were the primary factor in Raynaud's disease, should not the imperfect result have been apparent immediately after operation?* Instead of this, in the cases under discussion we have observed a gradual return of spasm beginning to take place at about six months, approximately the time one would expect nerve regeneration to manifest itself. As further evidence against the theory of a purely local fault in the digital arteries with normal tone in the sympathetic nervous system, how are we to account for the excessive perspiration which is such a striking characteristic of these cases? How are we to explain the marked vascular responses that go with emotional changes?

Simpson, Brown, and Adson[6] have raised some of these same objections against Lewis' hypothesis and believe that the great weight of evidence substantiates Raynaud's original theory of a vasomotor neurosis. For our part, while these observations have forced us to pause before giving up the older theory, yet Lewis' idea of a local abnormality in the arteriolar muscle cannot easily be disproved. To overcome Lewis' objections it must be proved that the sympathetic nervous system is in a state of exaggerated tonus. No completely convincing evidence on this point has yet been produced. On the other hand, in order to accept his theory without reservations, it is our feeling that we must find unequivocable evidence of vasospasm in early uncomplicated cases after vasomotor tone has been completely abolished. Lewis himself admits that this may be difficult. Therefore, it still remains to be shown satisfactorily whether the local changes arise spontaneously and are the primary cause, or whether they are merely the end results of chronic circulatory stasis of neurogenic origin. The latter theory seems to account most fully for the clinical facts which we have observed.

The purpose of this paper has been twofold: first, to stimulate a renewed interest in the etiology of Raynaud's disease; secondly, to show by a series of case reports the present efficacy of sympathetic neurectomy in bringing about a permanent interruption of vasoconstrictor tone. Resection of the lumbar ganglia unquestionably accomplishes this end in a complete and permanent manner. Out of twelve operations in this clinic where the second to fourth lumbar ganglia have been resected for varying conditions, no return of sympathetic activity has been observed. The consensus of other writers likewise shows that the results of operation for Raynaud's disease in the feet have been uniformly successful. In the upper extremity, however, where we have performed this operation 10 times, 4 instances of late regeneration of sympathetic function have been observed*. Following Adson's more recent procedure[5], we are now resecting the first rib and taking particular pains to excise the inferior cervical, as well as the first and second dorsal ganglia, but sufficient time has not yet elapsed to draw conclusions from these cases. It is the writer's belief that if this operation succeeds, there will be few operative failures in the early uncomplicated cases and that, regardless of which theory of the origin of Raynaud's disease will be ultimately proved correct, the treatment of the favorable cases will be by removal of the vasomotor nerves to the involved extremities.

SUMMARY AND CONCLUSIONS

1. Six cases of typical Raynaud's disease are reported, with observations on the immediate and late effects of sympathetic neurectomy.

*This was obvious in Case 6 and in the most sclerosed digits of Case 4. Lewis' cases also are of the severe type.

*During the period in which this report has been in preparation, we have been informed of 5 more cases of late recurrence of Raynaud's symptoms which have taken place following resection of the first and second dorsal ganglia in private patients operated upon by the members of the Peripheral Vascular Clinic. In each of these patients there had been a complete relief of symptoms over a period of approximately 6 to 8 months. As in Cases 3 and 4 above, the disease returned following the reappearance of sympathetic nerve activity.

2. Resection of the two upper dorsal ganglia or of the second to fourth lumbar ganglia brought about an immediate paralysis of sympathetic tonus in each case. Whereas vasomotor paralysis following lumbar sympathectomy has been permanent, the dorsal operation has been followed by a recurrence of sympathetic nerve function in 2 out of the 5 cases reported here and of 5 more operated on outside the hospital by members of the Vascular Clinic. Sympathetic nerve activity has reappeared at the end of six months, accompanied by the color changes, pain, coldness, and ulceration in the tips of the fingers characteristic of Raynaud's disease. When the regenerated vasoconstrictor fibres were again adequately blocked by novocaine or by re-operation, there was a second disappearance of the manifestations of the disease. Therefore, resection of the first and second dorsal sympathetic ganglia alone is insufficient to cause a permanent vasomotor paralysis of the arm. In our recent cases, where the operation has been extended upwards to include the inferior cervical ganglion, we are hopeful that the results will be as permanent as those in the lower extremity.

3. Advanced stages of the disease with long-standing ulceration and sclerodermatous changes may fail to recover completely after vasomotor paralysis. These instances are satisfactorily explained by Lewis' theory of local pathology in the digital vessels.

4. From the theoretical standpoint, early uncomplicated cases of the disease may be explained either on the basis of Raynaud's original conception of a vasomotor neurosis or by Lewis' theory that normal vasoconstrictor impulses cause the attacks of partial asphyxia by acting on abnormal digital arterioles. Certain objections have been pointed out against each hypothesis. It is therefore essential to reserve final judgment until the evidence in favor of one or of the other becomes unequivocal.

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WHAT CHANGE IN THE MEDICAL PRACTICE ACT IS MOST NEEDED?*

BY STEPHEN RUSHMORE, M.D.†

I SHALL begin what I have in mind to say by answering this question in summary fashion and then I shall go on to discuss the answer and the reasons therefor. The change in the Medical Practice Act of Massachusetts that is most needed is to give to the Board of Registration in Medicine the power to refuse to admit a candidate to examination if, after investigation, the Board does not approve of the school from which the candidate received his degree in medicine.

I would not have you think that, because I make this answer, there is no other change needed in the law, and I am aware that other persons may regard some other change as more important and more urgently needed. But without discussing the comparative importance or urgency of other proposed changes, I shall confine my remarks to a consideration of why this particular change should be made.

The medical practice act is a manifestation of the police power of the state, exercised for the protection of the public, by what is known as restrictive legislation. The original statute was called "An Act to Regulate the Practice of Medicine," and although in recodification this title has disappeared, the purpose of the law has remained unchanged.

"An act to regulate the practice of Medicine." Immediately three questions arise. What is an Act? What is the Regulation? What is the practice of Medicine? The nature of an Act involves a legal question which I shall not consider at this time. The nature of the practice of medicine is not defined in the law: there are indeed some who claim that such definition is the most important change needed. How can you regulate the practice of medicine if you do not know what it is? But without seeking, for the moment, to define what it is that the State is trying to regulate, I shall confine my comment to some aspects of the regulation.

The regulation pertains to the beginning, the continuing and the ending of the practice of medicine and the statute sets forth certain conditions of qualification which must be fulfilled by the candidate in order that he may receive recognition by the State. It is to be noted that not all of these qualifications are fulfilled once for all time, and that as time goes on and circumstances change, certain conditions of qualification may become unfulfilled and, through the power of continuing regulation, recognition by the State may be and sometimes is withdrawn. There is, after all, but one major question before the Board, and it is before the Board no matter at what point in the procedure the candidate appears. "Is the candidate fit to practice medicine?" If he is fit, he should be licensed; if he is not fit, he should not be licensed no matter for how many years he may have held a license.

Before considering in detail any of the conditions which are found in the Massachusetts statute, it may be well to dwell for a moment on what we ought to expect of the statute, what is the function, so to speak, that the statute should perform. This may seem very elementary, but often we forget the limitations of statutory enactment and there is a widespread tendency to say, whenever we find any condition in society that we do not like, "there ought to be a law about it". If, by hook or by crook, we can get a law enacted we have a tendency to think that the matter is settled, whereas nothing may be actually settled and the law may become a dead letter. It is important to remember that the standards set up by the law are not ideal standards. At best they are minimum standards representing a reasonably high possibility of attainment. What then is reasonable? Let us consider the specific conditions of qualification from this point of view.

The statute says the candidate must be 21 years of age or over, and of good moral character, must possess the educational qualifications required for graduation from a public high school and must have received the degree of doctor of medicine or its equivalent, either from a legally chartered medical school having the power to confer degrees in medicine which gives a full four years' course of instruction of not less than thirty-six weeks in each year or from any legally chartered medical school having such power, if the candidate was on March 19, 1917 a matriculant thereof; and must pass an examination, the details of which need not detain us now, but which shall be sufficiently thorough, according to the statute, to test the applicant's fitness to practice medicine.

Let us apply the test of reasonableness to some of these conditions of qualification beginning with the one noted last in the statute. Is the test by examination reasonably adequate to determine fitness to practice medicine? For anyone who is familiar with examinations and their limitations and I suppose all of us have taken enough examinations at one time or another to make us feel that the examination did not do us full justice, the answer will be No. The field within which the test by examination is adequate is so restricted that other supple-

*Read before the Annual Meeting of the Suffolk District Medical Society, April 27, 1932, and before the May Meeting of the Plymouth District Medical Society, May 19, 1932.

†Rushmore—Secretary, Massachusetts State Board of Registration in Medicine. For record and address of author see "This Week's Issue," page 1221.

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BY STEPHEN RUSHMORE, M.D.†

I SHALL begin what I have in mind to say by answering this question in summary fashion and then I shall go on to discuss the answer and the reasons therefor. The change in the Medical Practice Act of Massachusetts that is most needed is to give to the Board of Registration in Medicine the power to refuse to admit a candidate to examination if, after investigation, the Board does not approve of the school from which the candidate received his degree in medicine.

I would not have you think that, because I make this answer, there is no other change needed in the law, and I am aware that other persons may regard some other change as more important and more urgently needed. But without discussing the comparative importance or urgency of other proposed changes, I shall confine my remarks to a consideration of why this particular change should be made.

The medical practice act is a manifestation of the police power of the state, exercised for the protection of the public, by what is known as restrictive legislation. The original statute was called "An Act to Regulate the Practice of Medicine," and although in recodification this title has disappeared, the purpose of the law has remained unchanged.

"An act to regulate the practice of Medicine." Immediately three questions arise. What is an Act? What is the Regulation? What is the practice of Medicine? The nature of an Act involves a legal question which I shall not consider at this time. The nature of the practice of medicine is not defined in the law: there are indeed some who claim that such definition is the most important change needed. How can you regulate the practice of medicine if you do not know what it is? But without seeking, for the moment, to define what it is that the State is trying to regulate, I shall confine my comment to some aspects of the regulation.

The regulation pertains to the beginning, the continuing and the ending of the practice of medicine and the statute sets forth certain conditions of qualification which must be fulfilled by the candidate in order that he may receive recognition by the State. It is to be noted that not all of these qualifications are fulfilled once for all time, and that as time goes on and circumstances change, certain conditions of qualification may become unfulfilled and, through the power of continuing regulation, recognition by the State may be and sometimes is withdrawn. There is, after all, but one major question before the Board, and it is before the Board no matter at what point in the procedure the candidate appears. "Is the candidate fit to practice medicine?" If he is fit, he should be licensed; if he is not fit, he should not be licensed no matter for how many years he may have held a license.

Before considering in detail any of the conditions which are found in the Massachusetts statute, it may be well to dwell for a moment on what we ought to expect of the statute, what is the function, so to speak, that the statute should perform. This may seem very elementary, but often we forget the limitations of statutory enactment and there is a widespread tendency to say, whenever we find any condition in society that we do not like, "there ought to be a law about it". If, by hook or by crook, we can get a law enacted we have a tendency to think that the matter is settled, whereas nothing may be actually settled and the law may become a dead letter. It is important to remember that the standards set up by the law are not ideal standards. At best they are minimum standards representing a reasonably high possibility of attainment. What then is reasonable? Let us consider the specific conditions of qualification from this point of view.

The statute says the candidate must be 21 years of age or over, and of good moral character, must possess the educational qualifications required for graduation from a public high school and must have received the degree of doctor of medicine or its equivalent, either from a legally chartered medical school having the power to confer degrees in medicine which gives a full four years' course of instruction of not less than thirty-six weeks in each year or from any legally chartered medical school having such power, if the candidate was on March 19, 1917 a matriculant thereof; and must pass an examination, the details of which need not detain us now, but which shall be sufficiently thorough, according to the statute, to test the applicant's fitness to practice medicine.

Let us apply the test of reasonableness to some of these conditions of qualification beginning with the one noted last in the statute. Is the test by examination reasonably adequate to determine fitness to practice medicine? For anyone who is familiar with examinations and their limitations and I suppose all of us have taken enough examinations at one time or another to make us feel that the examination did not do us full justice, the answer will be No. The field within which the test by examination is adequate is so restricted that other supple-

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mentary procedures must be employed. Even if the examination is in part practical in character, in the sense of including taking the history of the patient, making the physical examination and performing certain laboratory tests, it is limited too much to mere information, which is indeed indispensable, but which is not enough. It is not that the examination does those things which it ought not to have done, but rather that it leaves undone those things which it ought to have done and there is small health in it. Although the statute states explicitly that the examination shall be sufficiently thorough to test the candidate's fitness to practice medicine, nevertheless it implies that the end is hopeless of attainment by these means for it precedes the examination by other tests which I have indicated.

If then the examinational test is even by the statute itself recognized as inadequate, are the other conditions of qualification reasonable? Of only one of these shall I speak, namely the kind of school from which the candidate shall have received his diploma.

On this point the statute says the school must be legally chartered, must have the power to confer degrees in medicine, and must give a full four years' course of not less than thirty-six weeks in each year, or any legally chartered medical school having such power of conferring degrees if on March 19, 1917, the candidate was a matriculant thereof.

Before considering the exact meaning of this educational qualification as specified in the Massachusetts statute, let us look for a moment at the education of nearly all of the candidates who present themselves for examination for licensure in these various United States. After graduation from high school, they have spent two, three or four years in some college of approved grade. Also they have spent four years in a medical school which is not only legally chartered and empowered to confer degrees in medicine, but which is generally regarded as having adequate educational standards. Under such conditions, the degree in medicine means an education in medicine that approximates fairly closely to standards of excellence that are generally regarded as necessary.

With the requirements of most other states, compare the requirements of the Massachusetts law. It does not require that the candidate go to medical school at all. If the candidate has the diploma indicating that he has received the degree in medicine, and the law shows no interest in how he acquires it, and if the school which is legally chartered offers a full four years' course, and the law shows no interest in whether the student takes or does not take the course which the school offers, the law is satisfied.

The effect of this rather remarkable wording of the law is that Massachusetts offers encouragement to diploma mills, at a time when except in Massachusetts diploma mills are discouraged. It is not however, that the Board of Registration encourages the diploma mill, for the Board is powerless to act.

It may be said that there are no longer any diploma mills in existence. In the absence of proof to the contrary the Board suspects that there may be some still plying their trade and certainly the diplomates of known mills have not disappeared. Some of the lower grade schools deserve no other designation than diploma mills. There was a school which was under suspicion for years, but the Massachusetts Board had to accept its diplomates under the law. Finally the State which granted the charter revoked it, on the ground that the school was a diploma mill and in the court proceedings there was evidence that the school did not give a full four years' course. Now the Board accepts from that school only diplomates who substantiate their claim that they were matriculants thereof on March 19, 1917. If the candidate presents a certificate signed by the Dean of the school to the effect that he was in the school on that date, it may be difficult to prove the certificate to be false. The way to deal with this problem is to give the Board power of disapproval, thus placing the burden of proof on the school to establish its claim to approval. I know it is said "What difference does it make how a man learns enough to practice medicine? If he can pass the examination he ought to be licensed." But the simple fact is that the possession of all the knowledge in the world would not qualify a man for the practice of medicine if, at heart, he was a thief, or a liar, or a murderer. It is the determination of the kind of person that the candidate is that is so important and for which the examinational test is so hopelessly inadequate.

How then can the fitness be determined? We have to acknowledge that it cannot be determined by the Board directly. It may be determined indirectly. It might be determined by letting everybody practice who wanted to do so, and then eliminating all who did not learn quickly to practice well. You see at once that is an impracticable solution.

Another procedure is to have the candidate practice for a brief period of time under close supervision. This is the aim of the internship requirement that is enforced by some schools before the diploma is given and by some states before license is granted. It is a wise requirement and I hope Massachusetts will have it some day. Another procedure is to watch the candidate closely throughout a sufficiently long period of education, having in mind all the time the question "Is he the right kind of person to practice medicine?" judging him by generally accepted standards at every step in his progress. There is of course no way of making sure that every candidate who reaches the end of his

course in a first class medical school, after at least two years in an approved college, will be the right kind of person to practice medicine. Yet one finds, as a matter of experience, that this process of selection by educational procedure does work pretty well; better, in fact, than any other system that is practicable, and the procedure generally employed. I mean outside of Massachusetts, licenses on the whole, reasonably well-qualified medical graduates. So, until a better method is found, Massachusetts might well adopt the scheme that is working successfully in other states.

I have referred to the "approved" college. Its part in the preparation of the candidate for the study and practice of medicine is very great and its importance is generally recognized outside of the Massachusetts law. For years this Commonwealth has been satisfied with standards which other states more sensitive to the needs and to the progress of education have weighed in the balance and found wanting.

I ought to say a word about enacting specific requirements in the law. The practice may prove harmful or at least inconvenient because when once the requirement is in the law, it may be very difficult to change, and actually changes are going on all the time in educational procedure. Of these a residuum is generally accepted as representing progress. Thus a certain flexibility of requirement in the law is wise. The disadvantage of introducing flexibility in the law is that it means the conferring of discretionary power on an administrative board that may not be discreet. This is an ever recurring, not to say permanent, problem in statecraft, which has to be met under varying conditions. The solution, here as elsewhere, is to confer the discretionary power, and to see to it that discreet persons are appointed.

There is another side of the picture that I might show you, a truly disedifying spectacle. It is to tell you some of the things that former students of these poorer schools say about them. It would be amusing and yet pathetic, for these students are often striving earnestly and seriously and to the best of their ability for higher things. Some of the practices of which they speak were common in proprietary schools of forty or fifty years ago: in fact these poorer schools are proprietary schools, an inheritance from the past, not old enough to be called antique, and not worthy of preservation.

Another question that I ought to mention but which I cannot take the time to discuss is: what disposition should be made of these poorer schools? The final disposition is outside of the province of the Board of Registration in Medicine. In a general way it is a matter of indifference to the Board whether the inferior school disappears or is transformed into an approved school. The Board is interested, at this point, in the quality of the medical education of the candidates who are to appear before it for examination. It may be that more medical schools are needed than exist now. But whatever the need for more schools or for fewer schools, there is no question but that medical education of poor quality should be eliminated.

The change then, in the Medical Practice Act of Massachusetts that is most needed at the present time is to give to the Board of Registration in Medicine the power to refuse to admit a candidate to examination, if after investigation, the Board does not approve of the school from which the candidate received his diploma, so that Massachusetts may do its share, as other states have done theirs, in bringing about this much-needed improvement in medical education.

FURTHER INFORMATION ABOUT RADIUM

A recent conference of physicians in New York has revealed an unanimity of opinion among authorities that dangers incident to use of water treated with an emanator of radium is harmful and that there can be no doubt of the serious effects of radium-containing salts in drinking water. The prolonged use of either of these waters is likely to be not only harmful but may be fatal and warning has been issued that anyone who has been led to use them should immediately consult a competent physician. The therapeutic value of any of the radium salt waters is extremely doubtful, according to cumulative evidence which is at hand.

In New York an amendment to the sanitary code is to be adopted prohibiting the indiscriminate sale of radium products in New York City. Dr. Frederick Flynn of Columbia University Medical School and an authority on radium is quoted as having said "some persons have a much greater capacity for the assimilation of radium salts than others, although undoubtedly prolonged use of the waters results fatally".

Dr. Alexander O. Gettler, Bellevue Hospital toxicologist, has demonstrated the effect of radium on Mr. Byers's bones. This was the man who died as a result of radium poisoning, following the use of drinking water containing this agent. Dr. Gettler has shown that a definite radium reaction was found in the bones as well as the ashes of the heart and kidneys.

Health Commissioner Wynne, Dr. Charles Norris, chief medical examiner, and other radium experts were in attendance at the conference. Dr. Louis Fischer, Dr. John W. Brannan, Dr. Seymour Oppenheimer, Dr. Philip Eischer, Dr. David J. Kaliski, Dr. Jacob Sobel, Dr. Harry Schwartz, Dr. H. S. Martland, Dr. Anna Williams, Dr. Louis Schwartz, Dr. W. K. Williams, Dr. A. McGowan, Reginald Miller and Dr. Charles Bolduan attended the meeting.

CASE RECORDS
of the
MASSACHUSETTS GENERAL HOSPITAL

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICAL-PATHOLOGIC EXERCISES

EDITED BY RICHARD C. CABOT, M.D.
F. M. PAINTER, A.B., ASSISTANT EDITOR

CASE 18231*

AORTIC REGURGITATION BEGINNING AT THE AGE OF FIFTY YEARS IN A MAN WHO SUFFERED FROM ATTACKS OF UNEXPLAINED FEVER

MEDICAL DEPARTMENT

PRESENTATION OF CASE

DR. PAUL D. WHITE: This case is very important and very interesting, one of the most valuable in some respects that I have seen for several years.

In November 1930 Colonel A. was referred to me because of the finding of a heart murmur on routine examination. The examination was perhaps a little more than routine, however, since he had been ill just prior to the finding of the murmur. He was fifty-one years old in November 1930.

The history is that he was always well and active except for scarlet fever and diphtheria in childhood, amebic dysentery in 1902, and pneumonia in 1919. From 1919 until August 1929 he was quite well. In August 1929 he had a septic throat which has become more and more prominent in my opinion of the case, although it did not seem so important when I first took the history. He was sick about two weeks in the hospital and had a slow convalescence lasting for several months, during which time he did not regain strength very fast, although he went back to service.

In January 1930 he was taken sick again and went to the Fort Banks Hospital for what was called influenza; there was a slight temperature for a few weeks. Then he was sent to Panama for two months. At first he was convalescent; then, having fever again, he went to the Gorgas Hospital for a few weeks. He ran a temperature, never high, but nevertheless definite. His tonsils were removed in Panama after the development of some pain in the sacro-iliac region and in other joints had occasioned a diagnosis of arthritis. While he was in the Gorgas Hospital the heart murmur was found for the first time. He came north again in the spring and went to the Walter Reed Hospital in May 1930. He was still running a little temperature. There he was suspected of having subacute bacterial endocarditis, but there was no proof of such an infection. It was simply believed to be a possibility. Gradually the temperature cleared up and he was discharged convalescent. He arrived in Boston in November.

*This case is reported in the main from a conference of the hospital staff. A few additions have been made from the pathologic discussion in Dr. Cabot's class.

On November 26, 1930, when I first saw Colonel A., I made the following findings on examination: "No abnormalities except for moderate enlargement of the heart and an aortic diastolic murmur. The maximal apex impulse of the heart is in the sixth space, 11.5 centimeters to the left of the midsternal line, 3 centimeters beyond the midclavicular line. There is no abnormal percussion dullness at the base. There is a long blowing diastolic murmur in the aortic area and along the left sternal border, transmitted to the apex, where it is less well heard. There is a slight systolic murmur at apex and base but no mitral diastolic murmur. The heart rate is normal. The radial artery walls are soft. The lungs are clear. There is no evidence of congestive failure. Neither the liver nor the spleen is palpable. There is no clubbing of the fingers. The tonsils are out. There is slight increase in the arterial pulsation of the neck. The knee jerks are normal, the pupils normal. The pulse is 66. There is no fever. The blood pressure is 135 systolic and 85 diastolic." He seemed perfectly well. An electrocardiogram showed normal rhythm, rate 70, without definite abnormality of complexes. Fluoroscopy showed a moderately enlarged heart with a slightly dilated pulsating aorta. Wassermann and Hinton tests were negative, as they had been repeatedly at the Gorgas and Walter Reed Hospitals.

There was no doubt about a diagnosis of aortic regurgitation. Evidently this aortic regurgitation had developed within a year, between the ages of forty-nine and fifty. Naturally his age and history suggested the probability of aortitis, but we had no proof of such a diagnosis. I made a diagnosis of aortic regurgitation of unknown cause.

DR. J. DELLINGER BARNEY: Have you any report of the urine at that time?

DR. WHITE: The urine was normal at the time I saw him, although pyelitis had been suspected; such a condition had not attracted much attention in the Gorgas Hospital but it was thought present and treated in the Walter Reed Hospital, and later at the Fort Banks Hospital in November 1931 the urine was found to show colon bacilli and pus cells, occasioning a diagnosis of pyelitis. I do not think that pyelitis was considered to be a major diagnosis at the Gorgas Hospital, although it may have been at the Walter Reed Hospital. Do you remember about that, Dr. Barney?

DR. BARNEY: I do not remember. At the Walter Reed Hospital and later at the Fort Banks Hospital he was treated for what was supposed to be simple pyelitis.

DR. WHITE: Yes, but most of that was later on, in 1931; at the beginning in 1929 I do not think that infection of the urinary tract was a very important feature. Dengue fever was also suspected in Panama, but there was never any evidence of dysentery or malaria.

I saw him for the second time on December 4, 1931. He had retired from service November 1, 1931. I examined him at the request of Dr. Barney, to whom he had been referred from the Fort Banks Hospital on account of pyelitis and continued fever. The fever had begun the first of December. When I saw him he had headaches, chills, sweats, and white and red blood cells in the urine. Incidentally he is the second patient whom I have seen with this condition who had first been referred to Dr. Barney because of pyelitis and who proved later to have something else more important than pyelitis. Dr. Barney found clear urine by cystoscopy in the present case and believed that there was some other explanation for the fever. The patient said that he had been gradually growing worse for three weeks.

He remained in the Baker Memorial Hospital for three months, until his death. He showed throughout this period daily fever with a low temperature in the morning and high fever in the evening. He had polymorphonuclear leukocytosis and slight secondary anemia and the blood cultures were positive for the streptococcus viridans. There was gradual failure with some pulmonary congestion towards the end, combated at first successfully by digitalis. He had while in the hospital a gradual development of slight clubbing of the fingers, not marked at death. There were a few petechial hemorrhages. There were a few evidences of emboli but there was no massive embolism. He died chiefly because of weakness. He had become more and more prostrated by the infection itself. The cardiac failure was only one factor in the final result.

A PHYSICIAN: Did the heart signs change?

DR. WHITE: Not at all during his stay in the hospital. He showed the same degree of aortic regurgitation, perhaps increasing a little at first. There was no definite evidence of mitral involvement at any time, and no aortic stenosis. The blood pressure never changed very much. He never developed a very full pulse. When I first saw him he had an unusually small pulse pressure, and the diastolic blood pressure was never very low. When he first came into the hospital after a month of fever it was 130/65. That changed very little throughout the course. February 21, two months after he entered, he looked quite well. The blood pressure then was 120/50. The heart was about the same size as before. We never felt the spleen definitely. There was a question of splenomegaly once or twice, but if it had not been for the course of the illness and the blood cultures we might not have been so confident of the diagnosis; he failed to show clearly most of the classical manifestations of subacute bacterial endocarditis.

CLINICAL DISCUSSION

DR. BARNEY: This man was referred to me from the Fort Banks Hospital, where they told me he had had pyelitis which they themselves had tried to relieve by medication and which as I understand it had been treated more adequately by renal lavage at the Walter Reed Hospital, where they found pus or colon bacilli in both kidneys.

When I examined this patient he seemed rather sick. I found essentially normal if not actually normal urinary findings. It was obvious to me that the cause of his illness and temperature lay elsewhere than in the urinary tract in spite of his history. At the time I examined him he had no evidence of pus in either kidney. I do not recall that we found a culture of colon bacillus from either kidney.

I was rather more awake on this case because some time previously I had seen a similar case, an older man with the same story of a great deal of pus in his urine at the time I saw him. I cystoscoped him and found pus coming from both kidneys, and I think he also had colon bacilli in both kidneys. This pus had persisted in the urine for a long time. I saw that patient first at his home and later in the Phillips House. He was sick, with a temperature, but he had no cardiac trouble that I heard about very definitely and I was not keen enough to realize that cardiac trouble was at the bottom of the story; otherwise I should have referred him to Dr. White before I did.

DR. WHITE: But it was only a few days after he came to the hospital that you did refer him to me.

DR. BARNEY: There was no obvious cause for his urinary infection, and it became evident either from his history or from the physical examination that his heart was in a very bad way, so I asked Dr. White to see him.

The point of all this is that I was entirely asleep on the first patient and was very much more wide awake in the case of the second patient. I think the urologist probably has missed a good many cases of this sort, where underlying a suspected pyelitis the real disease was endocarditis. I think we should have the heart more thoroughly investigated than has been our custom in the past, because after all that may be the underlying factor. The pyelitis is a very temporary matter.

A PHYSICIAN: How old was the other patient?

DR. BARNEY: He was about fifty-six or fifty-eight.

CLINICAL DIAGNOSES (FROM HOSPITAL RECORD)

Subacute endocarditis.
Aortic regurgitation.
Congestive heart failure.
Bicuspid aortic valve (congenital defect)?

ANATOMIC DIAGNOSES

Subacute bacterial endocarditis.
Probably old rheumatic endocarditis of the aortic valve.
Dilatation of the aorta.
Infarcts of the kidneys, old and fresh.

Pathologic Discussion

Dr. Tracy B. Mallory: This is one of a rather interesting group of three bacterial endocarditis cases all of which came into the hands of surgeons before they were seen by medical men. One of the cases, because of pain, swelling and spasm of the fingers, was sent to a surgeon as a question of Raynaud's disease. In another case appendectomy was done, undoubtedly for an embolus in the intestine; the patient finally died of a huge mesenteric embolus. So that it is not extremely rare for cases of bacterial endocarditis to have as a presenting symptom the results of an embolus which may very easily bring them into the hands of surgeons before those of medical men.

At autopsy we found the bladder, ureters, pelvis and kidneys perfectly negative. The prostate was not enlarged. I think it is very improbable that he had had at any time a very acute degree of pyelitis or cystitis. On the other hand we did find in the kidneys multiple areas of infarction some of which were fresh, some old. I think an old scarred infarct which we found was probably in its acute stage the cause of the original symptoms he had in the Walter Reed Hospital, including the pyuria. I think very probably there must have been some hematuria also, although that was not mentioned.

He had a very definite bacterial endocarditis limited almost entirely to the aortic valve. One of the rather unusual findings in the case was that there was very little evidence of a preceding rheumatic infection. Almost invariably in a case of bacterial endocarditis it is very easy to find on the uninvolved portions of the valves evidences of old rheumatic scarring. The mitral almost always shows some evidence of a preceding rheumatic process; we could find none in this case. One of his aortic cusps was relatively slightly involved in the acute process; it showed a little thickening and scarring. I think it is possible that he may have had rheumatic aortic regurgitation at the start. Otherwise we must assume that the bacterial endocarditis started on a previously normal valve, which is certainly a great rarity, though not an impossibility.

One other point of some interest was a very marked dilatation of his aorta, which measured about 4 centimeters above normal, the ascending portion just above the valve being involved. That raised the question whether the early signs might have been due to relative insufficiency of the aortic valve; but the dilatation did not extend down to the ring. The actual aortic ring was normal in size, measuring only 8 centimeters. I do not see any way in which a dilatation above the valve which does not actually involve the valve ring would give a relative insufficiency of the aortic valve. I think it is more probable that he had had an actual valve lesion of which there is only this one little fibrous scar left. Probably there had been a much more definite rheumatic endocarditis, but the ulcerative process had destroyed almost all evidence of it.

Dr. White: I should like to speak now of the point of particular interest, which was not so much the possibility of diagnostic confusion with other conditions but the fact that at fifty years of age without any definite heart disease before that we are sure of this man developed subacute bacterial endocarditis, and as Dr. Mallory has shown there was no evidence of lues or of aortitis. He either must have had aortic regurgitation dating back to early life, evidence of which had been missed at annual examinations,—and I do not believe he had it because he had been through many such examinations, and they could easily have picked up the murmur which I heard,—or else this must have been a new murmur developing at the age of forty-nine or fifty. The aortic regurgitation may have been from the beginning the result of subacute bacterial endocarditis with periods of freedom from fever and infection. That is very rare in our experience and to me it is very unlikely, though I suppose it is possible that he had subacute bacterial endocarditis for over two years with remissions.

Finally a third explanation, to me the most logical and most interesting, is that he probably developed aortic regurgitation as the result of the septic throat infection in 1929. We may call that rheumatic if we like, though it is not typically rheumatic; it is quite probably the sort of lesion that may affect the valve of middle aged men prior to the development of aortic stenosis. We have had a number of interesting cases here of aortic stenosis and we have wondered how the lesion started. It started in middle age. Is it not conceivable that this man had such an endocarditis which might have gone on to aortic stenosis eventually if he had not had the fatal complication of subacute bacterial endocarditis? We cannot prove this, but it is certainly food for thought. Thus this individual case may help very much in explaining the group of aortic stenosis cases in male patients. We see aortic stenosis not infrequent-

ly now in patients fifty and sixty years of age, particularly in men.

DR. HOWARD B. SPRAGUE: Unless another case has occurred in the last three years, this is the second case of malignant endocarditis of the aortic valve without involvement of the mitral valve that has been autopsied here in the past thirteen years.

DR. WHITE: Just before the autopsy we thought of the possibility of a congenital defect of the aortic valve. We even made a tentative diagnosis of bicuspid aortic valve, feeling that such a defect might have been a background favoring infection, but at autopsy the aortic valve was found to have the usual three cusps.

DR. BARNEY: In the case of this patient particularly and in my other case it is very interesting to find that infection in the kidney is due to the colon bacillus, whereas the real infection which causes the bacterial endocarditis is due to the streptococcus viridans. It is not uncommon to find underlying streptococcus or staphylococcus infection giving rise to colon bacillus infection in the kidneys. The streptococcus infection seems to give the colon bacillus a chance to take hold as it otherwise would not be able to do. I do not doubt that carefully studied smears of the urine sediment in this case would have shown the streptococcus in the midst of the colon bacillus. It is not enough to depend on cultures alone because the colon bacillus outgrows it.

FROM DISCUSSION IN DR. CABOT'S CLASS

DR. MALLORY: There are still a number of unexplained things about the case however. One of the most interesting is why he had aortic regurgitation nearly two years before death. At autopsy we found only acute lesions on the aortic and mitral valves, and there was one cusp of the aortic valve which showed questionable fibrous thickening at the base. It is extremely rarely that we get subacute bacterial endocarditis that is not on the basis of an old rheumatic, much more rarely a luetic, or occasionally a congenital aortic valve. Subacute bacterial endocarditis out of a clear sky is extremely unusual. I cannot rule out the possibility that he had had a rheumatic lesion in the past, but that the ulcerative process of his final illness had destroyed all trace of it. That rarely happens, however, and even when it does the mitral can usually be counted on to show signs of rheumatic involvement. There proved not to be a congenital bicuspid aortic valve; he had three good cusps. He had an extremely dilated ascending aorta of the senile type. On the other hand the actual valve ring was not greatly increased. I do not believe he had much if any real insufficiency of the aortic valve. The one other possibility that I can see is that he had bacterial endocarditis for two years. That is unusual but by no means impossible. The disease can last as long as that or longer. We also can have spontaneous remissions occasionally of months' duration. It certainly is not impossible that the process could have lasted as long as that.

DR. MAURICE FREMONT-SMITH: Does the type of organism have any bearing on the length of time? This is a different organism from the one you usually find, isn't it?

DR. MALLORY: As a matter of fact the organism was once reported as a viridans, once as non-hemolytic. We feel today that we do not know nearly so much about the streptococcus as we thought we did four or five years ago. We find that it is so very easy to make an organism hemolize or not hemolize, produce methemoglobin or not, that we feel that the distinction between the non-hemolytic streptococcus and the viridans is not nearly so clear cut as we thought it was a year ago.

DR. RICHARD C. CABOT: I remember very vividly a case I saw about twenty-five years ago down in Washington. Dr. Osler was there, and he took us all to see a physician who was one of the three discoverers of the transmission of yellow fever. I shall never forget that chart. It was in a room about the size of this amphitheater. Dr. Osler had pasted the charts end to end, joining each section with the following one. Thus pasted together the charts made a strip which went three times around the room. The patient had had fever for two years. Yet he could not see why Osler would not let him get up. He said, "I want to go out and play golf and this man keeps me in bed." The point I was emphasizing was the euphoria even after two years of fever. Osler said it was not very unusual, but I had never seen anything like it at that time.

I remember other histories in which one certainly would have a very strong impression from what the patient said that he had had bacterial endocarditis for many years, not merely for months. I am sure there are other long cases. That would account of course for his having regurgitation two years before death.

CASE 18232
POSTOPERATIVE FECAL FISTULAE AND OBSTRUCTING ADHESIONS

SURGICAL DEPARTMENT

PRESENTATION OF CASE

DR. CLIFFORD C. FRANSEEN*: This patient was a twenty-six year old Greek clerk who entered the hospital January 28 complaining of abdominal cramps.

Fourteen months before admission the patient had had a ruptured appendix, and an appendectomy with drainage was performed at another hospital. A fecal fistula developed in

*Senior interne on the West Surgical service.

the drainage tract. Nine months before entry a large abscess was drained through the wall of this sinus. The patient had continued to have abdominal cramps since his first operation. At seven months, six months, and four months before admission attempts had been made to close the fecal fistula, all without success. At the last attempt an ileosigmoidostomy had been done. The last two of these operations had been performed at the Baker Memorial Hospital, the others outside.

Two months before the present admission the patient was admitted to our wards with three fecal fistulae, but was discharged after two days without operation. On the pretext that he had to keep an appointment with his physician, the patient eloped at the time of his discharge from the hospital and was discovered five days later in a hospital in another city. The patient had found work in that city after leaving Boston, but was taken to the hospital when he suffered an attack of vomiting and abdominal cramps after a steak dinner. Here he was discovered with five drainage tubes in his abdomen. He was returned to our wards for two weeks and then discharged to a convalescent home.

At his present entry, the seventh, the patient still complained of abdominal cramps. His bowels had moved only once in two weeks and there was practically no discharge from his fistula. Physical examination showed him to be still surprisingly well nourished. The heart and lungs were normal. There were five abdominal scars and one fecal fistula. The abdominal wall about the fistula was considerably inflamed and the abdomen was moderately distended. The white blood cell count was 8,800, the red corpuscle count 6,350,000 and the hemoglobin 80 per cent.

The patient was kept in the Emergency Ward for two days with poultices to the abdomen. This gave him some relief. He was then sent to the ward and on January 30 a jejunostomy was done under local anesthesia. A few days later a barium enema was given which showed the fistula to join the bowel at the site of his ileosigmoidostomy. Two weeks after the jejunostomy had been performed a section of the ileum about four feet long was dissected free of adhesions and resected and an ileo-transverse colostomy done under spinal anesthesia. A few hours after operation the patient went into profound shock and rallied only after two blood transfusions. He slowly improved for a time but drained profusely from two necrotic loops of bowel which had been brought up and left open upon the abdominal wall at the time of the operation. Six days after operation a slight icteric tint appeared and slowly deepened. Eleven days after operation signs of fluid had developed at the right lung base and an ounce of bile-stained fluid was removed by thoracentesis. The development of this fluid was interpreted as secondary to subdiaphragmatic irritation, possibly from an abscess, but the patient had grown steadily worse and was in too poor condition to stand any further operative procedures. Two more blood transfusions were given two days apart, but the patient died on the thirteenth day after his last operation.

DR. AUBREY O. HAMPTON: This patient was examined a number of times. The first examination was with a barium enema, in July, six months before his last entry, demonstrating what we thought to be an adherent sigmoid and an irregularity of the cecum. We were able to fill the entire colon and the distal small bowel without any obstruction. There appeared to be a constriction in the ileum near the ileocecal valve. The deformity of the cecum was not very marked. We thought at that time that he had a fecal fistula of the cecum. A six hour examination demonstrated that the obstruction was not complete or acute.

The second examination was a month later. At this time a fistula was demonstrated at the terminal ileum. There was not any obstruction at that time. He was transferred to the General Hospital.

In November an ileosigmoidostomy was demonstrated apparently. The sigmoid was seen to be irregular. A possibility of diverticula was suggested, but I think we can attribute those irregularities to the adhesions, since he had had a very good examination before and we did not find them.

At this examination we injected the sinus tract and confirmed the last observation. The colon was really filled through the ileum. At this examination there are two sinuses demonstrated by x-ray, one between the small bowel and the sigmoid and another at the junction of the ileum and the transverse colon. At the sixth examination a small bowel fistula was demonstrated.

CLINICAL DIAGNOSES (FROM HOSPITAL RECORD)

Acute appendicitis with perforation.
Intestinal obstruction with peritonitis.

ANATOMIC DIAGNOSES

Acute appendicitis with perforation.
General peritonitis.
Subphrenic abscess.
Collapse of the lower lobe of the right lung.
Serous pleuritis.
Icterus.
Gangrene of portions of the ileum, the cecum and the sigmoid.
Operation wounds: resection of a portion of the ileum; sigmoidostomy; anastomosis between the ileum and the transverse colon; anastomosis between the ileum and

the sigmoid, with separation of suture lines.

Pathologic Discussion

could have following appendicitis. At the time of autopsy there was a general peritonitis, a subphrenic abscess lying over the dome of the liver, collapse of the lower lobe of the right lung and a serous pleuritis, also on the right, above the diaphragm on the same side that the subphrenic abscess was found. One of the suture lines had broken down. Another was still intact, but there were two free ends of intestine opening directly into the peritoneal cavity.

One point that interested us and I think was not brought out very clearly in the history was that in the terminal two or three days he became intensely jaundiced, much more jaundiced than either of the other two cases we have taken up today. Yet microscopically the liver was perfectly negative. So that we have in this group of cases a biliary cirrhosis*, the type of cirrhosis that is most regularly associated with jaundice, and a case of extensive pylephlebitis, neither of them markedly jaundiced, and a third case with intense jaundice and a perfectly normal liver.

Have you any comment on the surgical side, Dr. Churchill?

Dr. Edward D. Churchill: It was a prolonged tragedy starting from an acute appendicitis. The giving way of the suture line was in no way due to a fault in the surgical technic, but rather a result of the suppurating peritonitis.

*Case 18152, published April 14, 1932.

A Surgeon: What type of jaundice did you find?

Dr. Mallory: My guess is that it must have been septic, in other words due to hemolysis. We have had three cases in the last month showing quite deep jaundice, all with perfectly negative livers. As far as I know there have not been any antemortem chemical blood tests on any of them. It always has been more or less terminal, an affair of the last twenty-four hours, and I do not think anyone has been tempted to investigate the cases. I presume it is a straight sepsis with a hemotoxin from either streptococcus or gas bacillus.

A Physician: Didn't this patient have a red cell count of 6,000,000?

Dr. Mallory: He did have a red count of 6,000,000, but at the same time he was obviously dehydrated and his hemoglobin was only 75 per cent. He must have had a marked secondary anemia.

A Surgeon: Was the jaundice present when he had the high red cell count?

Dr. Mallory: No; that developed later.

Dr. Chester M. Jones: The depth of the jaundice does not correspond to the extent of liver damage, because catarrhal jaundice in people coming to autopsy generally shows nothing, and rarely a case of acute yellow atrophy has not been clinically jaundiced.

Dr. Oliver Cope: This man's jaundice must have existed a week or ten days before death,—quite a long time.

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CANCER OF THE THYROID

AMONG the disorders to which the thyroid gland is subject, cancer is overshadowed by the numerous cases of endemic goiter and hyperthyroidism. However, malignant disease of the thyroid is not to be neglected. Recent studies[1, 2] in this field have indicated that a fair amount of information as to the prognosis of the individual case and as to the sensitivity of the tumor to radiation may be obtained from histological examination.

One of the fairly frequent cancers of the thyroid, the malignant papillary adeno-cystoma, is so sensitive to radiation as to yield remarkably favorable results even when fairly advanced and apparently inoperable. Even though many tumors of the thyroid are seen late, biopsy is definitely indicated in view of the information that may be obtained.

That surgery alone is none too promising is shown by the data collected by Haagensen[1], that of 293 cases of cancer of the thyroid treated by surgery, less than 10% were well after ten years.

As a preventive measure, excision of adenomata is of definite value in view of the large proportion of thyroid cancers which arise from preëxisting adenomata. Unfortunately no criterion other than the histologic evidence of blood vessel invasion distinguishes the potentially malignant adenoma from the non-malignant.

REFERENCES

1 Haagensen, C. D.: Am. J. Cancer, 15:2063, 1931.
2 Clute, H. M., and Warren, S.: Am. J. Cancer, 15:2563, 1931.

RHODE ISLAND AND MASSACHUSETTS

A RECENT legislative event in a neighboring state deserves more widespread consideration than it has received. Rhode Island has placed educational institutions established within its borders or foreign institutions transacting business within its borders, under a certain control by the State Department of Education. The legislative act was noted by the daily press but too little attention was paid to its significance.

Have we here a monstrous infringement of the rights of the people to have such education (or lack of it) as they see fit to enjoy? There have been in Massachusetts, as elsewhere, individuals who in the name of freedom have resented any interference with the way they wanted to run the educational institution with which they were connected, and they have fought vigorously against any suggestion of control by any agency outside of themselves. "Liberty, next to religion has been the motive of good deeds and the common pretext for crime."

"A poor thing, but mine own, sir", is a characterization apt for many of our most treasured possessions; but it is because certain educational institutions performing certain functions, as for example, giving professional education and conferring the professional degree, have passed beyond the limits of "mine own, sir", and have become semi- or quasi-public institutions that social control, perhaps even by a governmental department is necessary.

One thinks of control often as a kind of "holding down", as if the institution wanted to expand and rise and put forth its strength and was prevented, and much is made of the possible harm of such restriction. But the control which is needed and planned and provided for, often by legislative act, is to prevent a degradation, a substitution of the worse for the better, a debasement of the educational currency, generally for financial gain. Massachusetts may well be proud of the achievements and attainments of some of its educational institutions. Of the degradation of others it may well be ashamed.

In Rhode Island, when the attention of the legislature was directed to an educational situation that needed remedial action, a comprehensive law was enacted promptly. In Massachu-

setts, when the Commissioner of Education asked the legislative committee on education to investigate a certain educational situation, the legislature paid no attention to his request.

The occasion for the change in the Rhode Island statute was the activity in that state under a Rhode Island act of incorporation, of an institution represented, among other things, by the daily press as having been "driven out of Massachusetts". It is to be noted that it was the Rhode Island legislature and not the Massachusetts legislature that protected the people of Massachusetts against whatever harm might have arisen from the continued activity of this institution.

For the protection of the public in Massachusetts, it is to be hoped that the example of Rhode Island will stimulate Massachusetts to make a more careful scrutiny of at least the educational institutions which play a part in preparing men and women for the practice of medicine. At the present time such scrutiny is conspicuous by its absence.

THIS WEEK'S ISSUE

CONTAINS articles by the following named authors:

WOODWARD, SAMUEL B. A.B., M.D. Harvard University Medical School 1878. President, Massachusetts Medical Society 1916-1919. His subject is "The Story of Smallpox in Massachusetts." Page 1181. Address: 58 Pearl Street, Worcester, Mass.

LEWIS, SIR THOMAS. M.D., F.R.S., F.R.C.P., D.Sc., C.B.E. Honorary Consulting Physician, Ministry of Pensions; Physician of the Staff of the Medical Research Council; Director of the Department of Clinical Research, University College Hospital, London. His subject is "Raynaud's Disease," summarized by Dr. Allen as stated below. Page 1192. Address: 10 Chesterford Gardens, London, N. W. 3, England.

ALLEN, ARTHUR W. A.B., M.D. Johns Hopkins University Medical Department 1913. F.A.C.S. Instructor in Surgery, Harvard Medical School. Associate Surgeon, Massachusetts General Hospital. Chief of Peripheral Vascular Clinic, Massachusetts General Hospital. His contribution is a summary of the paper on "Raynaud's Disease" by Sir Thomas Lewis. Page 1192. Address: 264 Beacon Street, Boston.

WHITE, JAMES C. A.B., M.D. Harvard University Medical School 1923. F.A.C.S. Tutor and Instructor in Surgery, Harvard University Medical School. Associate in Surgery, Massachusetts General Hospital. Consultant Surgeon, Massachusetts Eye and Ear Infirmary. His subject is "Raynaud's Disease." Page 1198. Address: Massachusetts General Hospital, Boston.

RUSHMORE, STEPHEN. A.B., M.D. Johns Hopkins University Medical Department 1902. F.A.C.S. Secretary, Massachusetts State Board of Registration in Medicine. His subject is "What Change in the Medical Practice Act is Most Needed?" Page 1211. Address: 520 Commonwealth Avenue, Boston.

MISCELLANY

A DIFFERENCE OF OPINION REGARDING THE HEREDITARY INFLUENCE OF EPILEPSY

At the 88th Annual Meeting of the American Psychiatric Association in Philadelphia recently Dr. Calvert Stein of Palmer, Massachusetts, submitted a statement to the effect that epilepsy is not hereditary. A number of scientists attending the divisional meeting on convulsive disorders challenged this statement although Dr. Stein submitted statistics showing that a study of the immediate families of 612 epileptics had revealed that only 4.1 per cent of these relatives had the disease.

MORTALITY RATES

Telegraphic returns from 85 cities with a total population of thirty-seven million for the week ending May 21, indicate a mortality rate of 11.4 as against a rate of 11.7 for the corresponding week of last year. The highest rate (18.2) appears for Washington, D. C., and the lowest (4.7) for South Bend, Ind. The highest infant mortality rate (15.7) appears for Lowell, Mass., and the lowest for Tacoma, Wash., which reported no infant mortality.

The annual rate for 85 cities is 12.4 for the twenty weeks of 1932, as against a rate of 13.4 for the corresponding period of the previous year.

NO EPIDEMIC OF INFANTILE PARALYSIS THIS YEAR

There will be no epidemic of infantile paralysis in this country this year, according to Hugh S. Cumming, Surgeon General and Director, U. S. Public Health Service. Dr. Cumming, writing in a forthcoming issue of *The Parents' Magazine*, says, "Fortunately assurances can be given, in view of our previous experience with poliomyelitis (infantile paralysis), that a widespread epidemic of this disease is practically out of the question in 1932. It was more prevalent in the United States in 1931 than in any year since the record-breaking epidemic of 1916 and one intense outbreak does not follow another within a year in the same community. It is to be remembered, however, that the disease occurs every year to some extent, and it is especially to be remembered that most muscles affected tend to recover entirely if they are kept from being stretched from the start, and later, after all tenderness has gone, if they receive carefully directed and graduated exercises, with proper rest, still avoiding stretching."

A NEW HEALTH UNIT

Bids were received until noon May 24 for the contract to build health unit No. 7 (four stories and basement) at Vernon, Hampshire and Whittier Streets, Roxbury, for Boston. This unit like the others will be financed through the income from the Robert White fund. The building will be of brick, limestone and granite and very much like the others already being operated.

THE STATE AND THE PRIVATE PRACTICE OF MEDICINE

Sir Arthur Newsholme is reported as having made public a conclusion that the relation of the practice of medicine by an individual and the State involves a vast and difficult field. His ideas appear in a volume which has been endorsed in a foreword by Dr. William H. Welch of Johns Hopkins.

In Sir Newsholme's book it is plainly stated that there is no single and simple conclusion to the effect that the family physician still has a function to perform which is the sum and substance of medical practice. He brings out clearly that the health of an individual is a communal as well as an individual concern and that doctors acting individually can no longer meet a large share of the medical needs of the community although much of the medical attendance under domiciliary service can be undertaken in conformity with the practice of medicine by the larger proportion of the profession. Much of the practice of the future will consist in the application of hygienic guidance both with reference to prevention and therapeutic management of disease. Some of Sir Newsholme's conclusions are very much in harmony with the results of the investigations which have been carried on in this country by the Committee on the Costs of Medical Care.

CORRESPONDENCE

A WARNING

June 3, 1932.

Editor,
The *New England Journal of Medicine*,

A few weeks ago a suave wine brick salesman, claiming to represent the Chateau Distributing Co. of Jersey City, N. J., came through Brockton and called on a number of members of both the medical and dental professions. The product was offered at a special sample price, for which payment was made in advance either by cash or check.

A letter sent to the New Jersey concern was returned unopened and marked "Cannot be found—Directory searcher No. 2."

It is therefore requested that the physicians be on the guard for a rather stocky built fellow about 5½ feet tall, of Jewish extraction, weighing around 165 lbs., going under the name of "A. Golden," as he is wanted by the police.

Respectfully yours,
ANTHONY M. CHAMP, M.D.

A NEW PITUITARY SYNDROME

May 31, 1932.

Editor, *New England Journal of Medicine*,

Since the publication of your editorial on "A New Pituitary Syndrome" in the issue of March 24, 1932, Dr. Cushing's paper has appeared, giving the actual case histories and photographs of many of his patients (*Bull. Johns Hopkins Hospital* 50:137, 1932). Without question there is a very striking resemblance in all these patients. The clinical syndrome seems to be distinctive and could hardly be missed by any acute observer, had he the clinical signs in mind. The question of the relation between this syndrome and the basophilic adenoma found in the anterior pituitary body in about one-half the cases is one that cannot be solved at the present time. There are many things pointing to the substantiation of Dr. Cushing's claim. An interesting review of the subject appears in the *Lancet*, May 21, 1932.

HENRY R. VIETS, M.D.
6 Commonwealth Avenue, Boston, Mass.

ARTICLES ACCEPTED BY THE AMERICAN MEDICAL ASSOCIATION COUNCIL ON PHARMACY AND CHEMISTRY

535 North Dearborn Street, Chicago, Ill.,
May 28, 1932.

Managing Editor,
The *New England Journal of Medicine*,

In addition to the articles enumerated in our letter of April 29 the following have been accepted:

Abbott Laboratories
Tincture Metaphen 1:200

Eli Lilly & Co.
Solution Liver Extract No. 343
Ampoules Solution Liver Extract No. 343, 10 cc.

E. R. Squibb & Sons
Ampules Iodobismitol, 2 cc.

The following article has been exempted and included with the List of Exempted Medicinal Articles (New and Nonofficial Remedies, 1931, p. 477):

Lederle Laboratories, Inc.
Sterile 1-1000 Solution Epinephrine Hydrochloride

Yours truly,
W. A. PUCKNER, *Secretary*,
Council on Pharmacy and Chemistry.

RECENT DEATHS

KILROY—DR. PHILIP KILROY, a well-known physician of Springfield, died suddenly at his home at 63 Chestnut Street on May 25, 1932. He was in his 67th year. He had paid especial attention to neurology and dermatology and had been in active practice in Springfield for 42 years.

Dr. Kilroy was born in Cavan, Northern Ireland, April 5, 1866, and came to Springfield early in life. He graduated from Holy Cross College in 1885 and studied medicine at Harvard University. After hav-

ing graduated from Harvard Medical School he went to Vienna in 1888 for study and returned to establish his practice in Springfield in 1890. He later made another visit to Vienna, Germany, and Paris. Dr. Kilroy had become proficient in French literature and culture and on several occasions had entertained French persons of note at his home.

He was the son of James and Catherine (O'Reilly) Kilroy. His mother was a sister of the late Bishop P. J. O'Reilly of the Diocese of Springfield. During the World War he was a member of the district medical advisory board.

Dr. Kilroy was a member of the Massachusetts Medical Society, having joined in 1890, the Springfield Hospital Staff, the Springfield Medical Club and the American Medical Association. He was formerly a member of the Mercy Hospital Staff.

His wife, the former Miss Katherine Quinn, and one daughter, survive him.

WELLES — Dr. Franklin Welles died May 18 after a short illness at the Lawrence Memorial Hospital. His home was at 8 Madison Street, Medford. Dr. Welles was a graduate of the College of Physicians and Surgeons in Boston.

ADDITIONAL FACTS OF INTEREST IN CONNECTION WITH THE NOTICE OF THE DEATH OF DR. EDWARD B. NIMS

Dr. Nims was a graduate of Williams College in the class of 1862 and was a member of a regiment which took active part in 30 battles of the Civil War. He went to Northampton in 1868 to take the position of assistant physician under Dr. Pliny Earle, superintendent, and continued in that capacity for 17 years with no break in continuity. This service was followed by his appointment to succeed Dr. Earle as the fourth superintendent in 1885. When Dr. Nims went to the hospital there were approximately 400 patients, but the succeeding years brought about a considerable growth in the institution.

Dr. Nims was born in Sullivan, New Hampshire, April 20, 1838, the son of Seth Nims and was graduated from Kimball Union Academy, Meriden, New Hampshire, in 1858.

His service in the Army was as commissioned assistant surgeon in the 1st Vermont Regiment of Cavalry. His regiment participated in the Wilderness Campaign and was present at the fall of Richmond.

In addition to his professional duties Dr. Nims was active in many Northampton social organizations.

NOTICE

RADIO HEALTH MESSAGES

JUNE, 1932

Sponsored by the Public Education Committee of the Massachusetts Medical Society and the Massachusetts Department of Public Health.

Courtesy WBZ. Tuesdays, 4:20 P.M.

June
14 New Findings in Oral Hygiene
21 Community Public Health
28 Communicable Diseases

STATE HOUSE BROADCAST

Sponsored by the Massachusetts Department of Public Health.

Courtesy WEEI. Fridays, 12:30 P.M.

Health matters of public interest discussed by the Division Directors of the Department.

RADIO HEALTH FORUM

Queries from the public are answered under the sponsorship of the Department of Public Health.

Courtesy WEEI. Fridays, 4:50 P.M.

Questions on Health and Prevention of Disease may be sent to Radio Health Forum, State Department of Public Health, State House, Boston.

REPORTS AND NOTICES OF MEETINGS

PLYMOUTH DISTRICT MEDICAL SOCIETY

The May meeting of the Plymouth District Medical Society was held at the Lakeville State Sanatorium on Thursday, May 19, 1932, at 11 A.M. Dr. Charles G. Miles, president of the society, called the meeting to order. Dr. George A. Moore read the records of the previous meeting. The committee on resolutions of the late Dr. I. I. Richmond consisting of Dr. W. B. Bannerman, chairman, Dr. Peirce H. Leavitt and Dr. Albert Hunt were given further time. Dr. Thomas H. McCarthy, the Plymouth District Representative on the Committee of Public Relations, gave a short report on what the committee had done and commented on its value to the general practitioner.

President Miles appointed a committee on clinics, for the year 1932, consisting of Dr. John J. Condrick of Brockton, chairman, Dr. Richard B. Rand of Abington, Dr. John J. McNamara of Brockton, Dr. Charles Hammond of Hanover, and Dr. Frederick W. Murdock of Brockton.

It was decided to hold the summer meeting in Plymouth where it has been held for the past few years. The members of the Plymouth District Society that live in Plymouth have entertained the society royally with a fine entertainment and excellent programs in the Jordan Hospital. The committee on arrangements for the summer meeting was appointed. This committee consists of Dr. Thomas H. McCarthy, chairman, Dr. Leonard A. Baker of Middleboro, Dr. Edgar Hill of Plymouth, Dr. John J. Curtin of Plymouth and Dr. W. A. Hanson of the Bridgewater State Hospital.

The principal speaker of the morning was Dr. Stephen Rushmore, Secretary of the State Board of

Registration in Medicine. He took for his subject, "What Change in the Medical Practice Act Is Most Needed?" Dr. Rushmore spoke for over an hour and answered questions for at least 45 minutes. His talk in regard to the duties of the secretary of the State Board of Registration in Medicine and also the way that the Board handles the various complaints that come before it was extremely interesting. It was a very fine, practical talk in every way.

An enthusiastic vote of thanks was given Dr. Rushmore for his splendid talk. The meeting then adjourned to the main dining hall where a fine dinner was provided by Dr. Leon W. Alley, Superintendent of the Lakeville Sanatorium. A rising vote of thanks was given Dr. Alley for his excellent entertainment at the State Sanatorium.

Dr. Rushmore's address appears on page 1211 of this issue.

THE NORFOLK DISTRICT MEDICAL SOCIETY

The Norfolk District Medical Society held its meeting at the Boston Sanatorium January 26, 1932. During the afternoon the new buildings were inspected, ward visits made and the thoroughly equipped x-ray department demonstrated.

The meeting held in the new recreation building was opened by Dr. John F. O'Brien, assistant superintendent of the Sanatorium. He welcomed the members in a brief address, reviewing the work of the institution since its inception in 1908. He was gratified to inform the medical profession that Boston now has a sanatorium for the treatment of tuberculosis second to none in the state of Massachusetts in construction, equipment and skilled management.

Dr. W. B. Keeler, president of the Norfolk District Society, called the business meeting to order and appointed Dr. T. J. Murphy, visiting physician of the Sanatorium, chairman. Dr. E. A. Locke, physician-in-chief of the Sanatorium, spoke as follows on "Institutional Treatment":

On behalf of the staff, it gives me much pleasure to welcome the Norfolk District Medical Society to the sanatorium. We are delighted to have you make an inspection of the institution and shall be glad of your criticism. We desire most of all, however, to have your coöperation in this great public undertaking.

Some of you can doubtless recall the origin of the organized anti-tuberculosis work in Boston, namely, the establishment of the day camp for the tuberculous on Parker Hill in 1905 by the Boston Tuberculosis Association. At the end of two years it was moved to the site now occupied by the new infirmary building which you have just seen where it continued to function for many years. From this simple beginning has gradually developed the present sanatorium with a capacity of approximately six hundred beds. The Boston Sanatorium, one of the first built in the United States, coincides more or less in its development with that of the general nation-wide organization against tuberculosis.

The various factors concerned in this general anti-tuberculosis organization stand out very distinctly and a brief discussion of these will clarify the function of such institutions as this.

1. *Sanatoria*—The first effort made to control tuberculosis was the establishment of the sanatoria for the treatment of the early case—the paramount consideration being the cure of the disease. The first to be established in the United States was the Adirondacks Sanatorium, now called the Trudeau Sanatorium, which was built in 1887. The second sanatorium in the country was opened at Sharon, Mass., in 1891, under the direction of Dr. Vincent Y. Bowditch. The first sanatorium to be provided by any state was opened at Rutland, Mass., in 1897. The total number of these sanatoria, public and private, has rapidly increased until they now number 460.

The great influence which these sanatoria have exerted in many ways is universally acknowledged and they still hold a very prominent place among the forces marshalled against the disease.

2. *Local and National Volunteer Anti-tuberculosis Associations*—Such organizations have played a major rôle in the development of the whole campaign against tuberculosis. From the first the chief function of these volunteer associations has been accepted as essentially educational and their greatest usefulness in blazing the way for the development of the municipal and state programs of tuberculosis work. We may say that they have very largely inspired the rapidly spreading tuberculosis public consciousness. Relief work and after-care among the tuberculous have always figured prominently in the activities of these associations.

To our Boston Tuberculosis Association is due much of the credit for the initiative which led to the assumption on the part of the city of the responsibility for the care of the tuberculous sick in Boston. The Boston Anti-tuberculosis Association was founded in 1902 and the National Association for the Study and Prevention of Tuberculosis in 1904.

3. *Special Instruction on Tuberculosis in Medical Schools*—Much has been done to raise the standard of teaching in tuberculosis in the medical schools of the country. Especial attention is not only given to the clinical features of the disease but to the general sociological considerations of the disease as well. I think it safe to say that all first-class medical schools in the United States now have access to tuberculosis sanatoria or hospitals for clinical instruction.

4. *Local and State Health Activities*—More and more largely the burden of anti-tuberculosis work has fallen on the shoulders of health authorities whose various functions may be grouped as follows: (a) maintenance of a dispensary clinic for the diagnosis and care of the tuberculous; (b) the reporting and permanent registration of all cases; (c) direct and indirect social relief; (d) educational propaganda, and, (e) the maintenance of tuberculosis hospitals.

It is this last function with which we are con-

cerned today and regarding which I have been asked to speak very briefly. In 1907 when the problem of Boston's organization against this disease was under discussion, the advice of the most eminent physicians closely identified with tuberculosis work throughout the country was sought as to the most vital work to be undertaken. The unanimous opinion was that the paramount issue to receive immediate attention was the great need of a hospital for the chronic case, the central idea being that if the individuals with advanced pulmonary tuberculosis could be permanently segregated the danger of contagion to the uninfected would be greatly reduced and therefore contribute materially to the control of the disease. The first undertaking then of the board of trustees was to erect a permanent, strictly fireproof type of ward building for the care of the indigent and especially the irresponsible members of the community afflicted with tuberculosis. Then and for many years thereafter the type of case treated was chiefly the advanced one.

The opinions given at that time were also very emphatic that the chronic and acute cases should never be treated in the same institution. Until the past two or three years the predominance of the moderate and far advanced cases in the institution has been overwhelming. Very gradually, however, during the past twenty-five years these ideas have become modified until today we find all types and stages of pulmonary tuberculosis being treated in the same hospital and with every evidence of eminent success. Indeed, we now have an accepted and standardized type of hospital with the buildings adapted to the bed, the semi-ambulatory and ambulatory cases. The first type of case requires a permanent type of hospital building usually designated as the infirmary. In the ideal hospital grouping the infirmary is closely associated with the administrative office and often under the same roof. All cases of whatever stage admitted to the sanatorium are sent to the infirmary for observation and later transferred to the appropriate unit of the institution.

In contrast to the infirmary the wards for the ambulatory cases are designed primarily to ensure open air treatment and are therefore built with ample verandas and so placed as to make graduated exercise in the open air possible immediately adjacent to the building. Recreational facilities for this type of case are particularly necessary. It is considered desirable when possible to place the wards for the early cases at a considerable distance from the infirmary as it seems mutually advantageous that the two groups shall not come into close contact.

Between these two extremes is the ward for the semi-ambulatory patient which is designed to meet the requirements to some extent of both.

This afternoon you have seen all of these requirements well illustrated in our sanatorium layout. For the strictly ambulatory cases of which we now have a much larger number than formerly we have the two new open ward buildings, one for men and one for women. The semi-ambulatory cases are treated in the original group of pavilion wards in the background of our group. Here the single rooms and the small and large wards make it possible to adapt the accommodations to the needs of the particular case. Many of these patients spend much of the day resting in the open while a few are able to take a little exercise. The infirmary is reserved for bed cases which usually represent an advanced stage of the disease. Even for these we have provisions for rest in the open air on the roof, the bed being wheeled from the yard.

Dr. Timothy J. Murphy spoke on the treatment of pulmonary tuberculosis by artificial pneumothorax.

The treatment of tuberculosis has gone through many phases. Rest, food, fresh air, heliotherapy, artificial light and surgery evidently lead as therapeutic measures. The vogue of vaccines and sera is declining. Mortality has appreciably decreased. Morbidity shows very slight fluctuations, however.

The urgent need of the times is a more aggressive attack on tuberculosis. The carriers with positive sputum are the offenders. They carry the torch of infection and keep alive the fires of activity. Every effort must be made to eliminate their ability to transmit the disease. Many activities have been inaugurated in the past toward this end. The advanced case has been isolated; campaigns to save the child from infection have been fostered; annual physical examinations advocated and appeals for early diagnosis made throughout the land. Undoubtedly much good has been accomplished, but the wave of morbidity shows little decline.

Will lung surgery help? In 1888 Forlanini began his work on artificial pneumothorax, and reported some of his cases in 1894. Here in America, John B. Murphy of Chicago was the first to follow Forlanini. At that time and for many years afterward there were few institutions for the treatment of tuberculosis, and the new treatment found few advocates. Within the last decade, however, artificial pneumothorax has grown in favor.

In artificial pneumothorax we have a means of reducing the number of positive sputum cases and eliminating a fruitful source of transmitting tuberculosis. Lung collapse not only retards the growth of the bacillus, but stimulates fibrosis. But there is a right time for the operation. It should not be done too early, for the early case of tuberculosis readily heals if properly treated. When tried late, adhesions often thwart success or an active process involves the contralateral lung.

There has been a marked change in the selection of cases since the early days of pneumothorax therapy. Then only patients with monolateral disease were deemed suitable for compression. Today the pendulum has swung completely the other way. Advanced cases with bilateral involvement are compressed, and at times both lungs simultaneously.

In one Western city, I understand, 78 per cent of the cases at the municipal sanatorium were undergoing pneumothorax treatment. Today there is a strong impulse to advise this treatment for ambulant cases in the dispensaries or physicians' offices. In the early days of pneumothorax, ambulant cases were allowed to go home immediately after treatment. Today that would be considered unwise. Whether mass treatment by artificial pneumothorax is justifiable is in my estimation open to speculation.

In the Boston Sanatorium we have 580 beds. The cases are mainly advanced and far advanced. One hundred and ten cases were selected for artificial pneumothorax. Treatment was discontinued on 56 cases. By reason of thickened pleura and adhesions, there was inability to admit gas in 24. In ten cases the process in the contralateral lung reactivated. Fluid developed in six; six died and two had pleural shock.

Of the 54 cases undergoing treatment, 47 showed improvement. One case, unsuccessful under phrenicectomy, is now decidedly improved with artificial pneumothorax. Where artificial pneumothorax failed, thirteen cases had phrenicectomy done.

While this is but a small group, nevertheless 42 per cent improved. Would not these cases make the same progress under the régime of complete surgical rest? If the cases were early, undoubtedly yes.

While we have had success in arresting some advanced cases with surgical rest, we find the healing process is speeded up with pneumothorax; the lung immobilized; cavities closed or partly so; sputum diminished and eventually free from tubercle bacilli. This is the goal we seek. Will lung surgery help?

Dr. Albert Ehrenfried then spoke on Phrenicectomy as follows:

Mr. President and Members of the Norfolk District Medical Society, I appreciate the privilege of discussing with you the subject of phrenicectomy. At the Boston Sanatorium we feel, as a result of our experience, that the operation offers great promise in the treatment of certain types of lung tuberculosis. I am presenting no formal paper; if anyone here wishes to learn in more detail about the application of surgical measures to the treatment of phthisis, I refer him to a recent article of mine in the *American Journal of Surgery**. Tonight I want to present results, for after all results are what count.

We must accept the fact that Surgery has begun to interest itself seriously in the thoracic conditions. Those of you who are old enough to look back on the surgeon's tentative approach to the abdomen realize how thoroughly he has acquired dominance in this field. The extension of the surgical attitude into the regions above the diaphragm has already well advanced, and it may not be long before surgery becomes intrenched in these regions.

*Ehrenfried, Albert: Surgical measures in the treatment of lung tuberculosis. Am. J. Surg. 12:95 (Apr.) 1931.

Stating the matter broadly, phthisis is a strictly medical disease until gross lesions develop. These lesions in their genesis and pathology are identical with similar lesions elsewhere in the body, except as their course is modified by the particular conditions which they have to meet in the thoracic cavity. The principles which underlie the treatment of such lesions elsewhere, apply with equal soundness to their treatment here, again with the exception that these principles must be modified to suit the special conditions.

The special conditions that we have in mind are first, the nature of the affected tissue; secondly, the non-collapsibility of this tissue, due to the pull of negative pressure within the thoracic cavity; and thirdly, the constant motion of this tissue in the continuous physiologic function of expansion and contraction. These conditions are all inimical to healing, and surgery, therefore, attempts to overcome them. The first we cannot modifiy: the second, non-collapsibility, and the third, constant motion, we can modify. Accordingly, in selected cases, the surgeon attempts to induce rest and collapse in the affected lung. This principle is called collapse therapy.

There are three methods in use for the purpose of carrying out collapse therapy. The first, which, after considerable opposition has now been generally adopted and in fact appropriated by the physician, is artificial pneumothorax. The second method, phrenicectomy, has enjoyed a much more favorable reception because of the ultimate success of its forerunner. The third, a far more severe procedure, is extrapleural paravertebral thoracoplasty. It is of the second, phrenicectomy, that I speak tonight.

It is only 20 years since the first adventurous soul had the temerity to induce paralysis of the diaphragm for the purpose of promoting rest and collapse in a tuberculous lung. He accomplished this by isolating the phrenic nerve as it ran down the neck on the affected side, and dividing, excising, or avulsing it. It was soon recognized that this procedure was a definite addition to our armamentarium in the treatment of phthisis, and its adoption was immediate and widespread. Large series of cases have been reported, and a recent article* records O'Brien of Detroit as being on his third thousand.

Being a relatively new procedure, the indications for the operation have not yet crystallized. In this institution we have arrived at certain conclusions. We use it only in cases where the disease is confined to one side, except where there is a small focus on the opposite side which is well under control. We consider it definitely indicated in cases where pneumothorax is indicated, but cannot be successfully carried out, or is refused. It is indicated in conjunction with pneumothorax as an adjuvant, to increase the effectiveness of the treatment, lengthen the intervals between injections, and diminish the incidence of pleural effusion and empyema. It is

*Trudeau, F. B.: Phrenic exeresis in the treatment of pulmonary tuberculosis. J. A. M. A. 98:309 (Jan. 23) 1932.

BOSTON SANATORIUM — SUMMARY OF PHRENICECTOMY OPERATIONS — SURGICAL SERVICE

	Age	Duration of Disease	Condition at Operation	Indications for Operation	Time Since Operation	Present Condition
1	18	3 yrs.	Fibrosis rt. apex, infilt. lower lung; left clear; sp. pos.	Unilat.; patient refuses. pneumothorax.	17 mths.	Asymptomatic; no signs of activity in lungs; sp. neg.
2	37	14 "	Extensive cav. left; sl. infilt. rt. apex. hemoptysis; sp. neg.	Predom. unilat., unsatisfactory for pneumothorax.	17 "	Symptomatically improved (less cough and dyspnea no hemoptysis); sp. neg.
3	28	3 "	Infilt. and fibrosis rt.; repeated hemoptysis; sp. pos.	Unilat.; attempts at pneumo. unsuccessful.	6 wks.	Died after persistent hemorrhage.
4	22	2 "	Fibrosis and cav. left; sl. infilt. rt. apex; sp. pos.	Predom. unilat.; unsatisfactory for pneumo.	16 mths.	Asymptomatic; signs improved; sp. neg.
5	19	10 mths.	Fibrosis and cav. left; rt. pract. clear; sp. pos.	Unilat.; attempts at pneumo. unsuccessful.	15 "	Symptoms and signs unchanged; sp. pos.
6	22	2 yrs.	Infilt. rt. base; sp. pos.	Unilat.; lesion confined to base.	12 "	After 3 mos. without improvement, artificial pneumo. instituted, improved; sp. pos.
7	26	3 "	Cav. left; infilt. rt.; sp. pos.	Predom. unilat.; attempts at pneumo. unsuccessful.	11 "	After 4 mos. was improved, left hospital against advice—out 3 mos.—re-ad: cond. worse; sp. neg.
8	18	14 "	Extensive infilt. fibrosis and cav. left; mod. infilt. rt., G. C. poor.	Predom. unilat.; attempts at pneumo. unsuccessful; last resort.	9 "	Became progressively worse and died.
9	38	2 "	Fibrosis and cav. rt.; left pract. clear; sp. pos.	Unilat.; patient refuses pneumo.	9 "	Symptomatically improved (less cough and sputum, gain in weight); sp. pos.
10	62	14 "	Infilt. and cav. both lungs, worse on left; sp. neg.	More advanced on one side, active for 14 yrs., unsatisfactory for pneumo.	9 "	Symptomatically improved (slightly less cough and sputum); sp. neg.
11	28	9 "	Fibrosis and cav. left; infilt. right; sp. pos.	More advanced on one side: patient refuses pneumo.	9 "	Becoming progressively worse, ontralateral lung becoming more involved; sp. pos.
12	35	16 "	Fibrosis and cav. left; sl. infilt. rt.; sp. neg.	Predom. unilat.; unsatisfactory for pneumo.	7 "	Symptoms and signs unchanged; sp. neg.
13	35	2 "	Fibrosis and cav. rt.; left pract. clear; G. C. poor; sp. pos.	Unilat.; attempts at pneumo. unsuccessful.	6 "	Becoming progressively worse; sp. pos.
14	22	2 "	Fibrosis and cav. left; rt. pract. clear; sp. pos.	Unilat.; attempts at pneumo. unsuccessful.	6 "	Symptomatically improved (less cough); sp. neg.
15	27	10 "	Fibrosis and cav. left; sl. infilt. rt. apex; sp. pos.	Predom. unilat.; attempts at pneumo. unsuccessful.	4 "	Symptomatically improved (less cough and sputum); sp. pos.
16	24	3 "	Diffuse infilt. left; little on right; sp. pos.	Predom. unilat.; with hemorrhage; attempts at pneumo. unsuccessful.	4 "	Symptomatically improved (gain in weight); sp. pos. (Horner's Syndrome).
17	18	5 mths.	Consolidation rt. base; sp. pos.	Unilat.; lesion confined to base.	4 "	Asymptomatic; works 2 hrs. daily; sp. neg.
18	19	14 yrs.	Fibrosis and cav. left; right clear; sp. pos.	Unilat.; attempts at pneumo. unsuccessful: considered for thoracoplasty.	3 "	Asymptomatic; works as orderly; sp. pos.
19	19	1½ "	Fibrosis and cav. rt.; left clear; sp. pos.	Unilat.; attempts at pneumo. unsuccessful; considered for thoracoplasty.	1 "	
20	24	9 "	Fibrosis and cav. rt.; fibrosis left apex; sp. pos.	Pract. unilat.; attempts at pneumo. unsuccessful; considered for thoracoplasty.	3 wks.	
21	31	1 "	Infilt. rt.; left pract. clear; sp. pos.	Pract. unilat.; attempts at pneumo. unsuccessful.	2 "	
22	26	1 "	Infilt. and fibrosis left; rt. pract. clear; sp. pos.	Pract. unilat.; attempts at pneumo. unsuccessful.	3 days	

indicated as a primary method of treatment in early cases generally which after some months of routine sanatorium care show no definite improvement. Finally it is indicated as a tentative procedure in selected fibrotic cases, with or without cavitation but with a mobile diaphragm, in which the only alternative is a thoracoplastic operation.

The series I am presenting is a small one, but it is our own. On the chart the cases are numbered in the order in which the operation was performed. Under successive columns you will note the patient's age, duration of disease at time of operation, condition at operation, indications for the procedure, time elapsed since operation, and finally the present condition. As each patient is presented to you, the number on the chart will be announced, so that the data on the individual case will be at your disposal.

In studying the chart you will note that our experience goes back seventeen months; four operations done within four weeks have not been included under "present condition", as this interval is too short to allow any judgment to be reached. You will note also that our cases are practically all advanced cases; the average known duration of the disease before operation was five years and nine months. You will note the frequency of fibrosis; fifteen of the twenty-two cases presented fibrosis. This is relatively poor material; we have the right to expect much better collapse, naturally, in early cases, before the lung tissue and cavity walls have been stiffened by chronic infiltrations and fibrotic changes. Of course you realize that the great bulk of cases in this hospital belong in just this classification. This series, then, becomes a very severe test for the method.

Of the eighteen cases with present condition recorded, we find four classified as entirely asymptomatic, and seven as symptomatically improved,—a total of 11 or 61%. There are 3 (or 17%) with symptoms and signs unchanged, 2 (or 11%) who have progressively deteriorated, and 2 (or 11%) who ultimately died. Of the two who are deteriorating, one (No. 7) showed distinct improvement until he left the hospital against advice four months after operation. He returned considerably worse from neglect of proper care three months later. The second (No. 11) was deteriorating at the time of operation, and had refused pneumothorax; after operation an infiltration on the opposite side lighted up. Of the two who have since died, the first (No. 3) was operated for persistent hemorrhage after attempts at pneumothorax failed. The operation did not help him, and he survived six weeks. The second (No. 8) was a last resort case, in poor general condition, in whom attempts at artificial pneumothorax had failed. In the eleven improved cases the change in the patient has frequently been rapid and remarkable.

There have been no operative difficulties or mishaps in this series. In one fibrotic case (patient in poor condition), the nerve was not easily located and the exeresis was not consummated. The procedure generally presents no technical difficulties. One case only (No. 16) has shown a complication. After operation this patient presented a mild degree of exophthalmos and lid-droop, not severe enough to be troublesome. This, the so-called Horner's syndrome, depends apparently on the unusual presence of certain symptomatic fibers in the phrenic bundle.

In conclusion I wish to state that in our experience with a carefully analyzed series of twenty-two cases, mostly advanced, this relatively simple surgical procedure has justified its employment. In approximately two thirds of these cases, in spite of chronicity, fibrosis and cavitation, there has been definite and sustained improvement, and in some patients the improvement has been spectacular.

Dr. Samuel Cline, laryngologist of the Boston Sanatorium, spoke as follows on "Nose and Throat Conditions in Tuberculosis":

With a hospital bed capacity of six hundred, one encounters during the course of years not only the common ailments referable to the ear, nose, and throat, but also those conditions dependent on the invasion of the tuberculosis bacillus into the tissues.

Considering first, pathology in the nose, symptoms dependent on obstruction by deviated septa are common. Several years ago, some writer hinted at the possibility of lesions in one side of the lung coinciding with obstruction of the nasal passages on the same side. This has not been corroborated, but in numerous cases where obstruction has been marked by deviated septa relief has been obtained by submucous resection, and with resulting benefit to the general welfare of the patient. Submucous resection has been performed only in quiescent cases, and I have not seen any untoward results from the operation.

Sinusitis, particularly the chronic form with pus and polypoid formation, has frequently been observed. There is no doubt that many individuals labeled as tuberculous with cough and expectoration have nothing more than pulmonary complications of a chronic sinusitis with secretion draining down the nasopharynx into the bronchial tree. These cases under treatment by suction and drainage, or by operation on the sinuses, have improved remarkably. The Caldwell-Luc operation and intranasal ethmoid exenteration have placed many of these cases on the road to health.

Concerning the question of tonsillectomy in the tuberculous, each case must be considered separately. Many patients suffer from acute exacerbation of chronically infected tonsils. If the tonsils are allowed to remain the general constitution is undermined, and the patient is unable to regain normal health. My feeling is that in suitable cases where the pulmonary status is quiescent, local tonsillectomy has been of extreme value. The operation has been without any shock to the patient, and the end

results have been uniformly good. Recently, with the improvement in diathermy apparatus, I have attempted the removal of tonsils by such means. The number of patients so treated is still limited, but the individual treatments can be done without harm to the patient and offer another means of eradicating infected tonsils. One case recently treated proved the efficacy of diathermy application. This patient, a man of 56, when first seen had a markedly congested throat, tonsils boggy and with fullness in both supratonsillar fossae almost resembling a double peritonsillar abscess. Uncertain whether it was infection, and hesitant to plunge a knife into the supratonsillar spaces, I decided to apply the diathermy to one tonsil. On the next visit the throat had quieted down so that abscess could then be definitely ruled out, and with a few subsequent treatments both tonsils had shrunk considerably and the soft palate and supratonsillar regions had resumed a normal appearance.

Tuberculous ulcers of the tongue are frequently seen. These ulcers are very painful and respond readily to treatment with the galvanocautery.

Chronic suppurative otitis media presents itself not uncommonly in the tuberculous. Conservative treatment is of great help—dry wipes, boric-alcohol solution, or instillation of iodized boric powder. It is but rarely that one sees any urgent symptoms demanding operative interference, and practically all the cases do well on conservative medication.

Laryngeal tuberculosis is the principal oto-laryngological complication to be seen in a tuberculosis hospital. Early diagnosis is of paramount importance so that proper treatment may be instituted. Voice changes which the patient notices, and early hyperemia constitute important landmarks in the early diagnosis. It is important that other causes of laryngeal pathology be ruled out and where there is doubt, blood tests and, if necessary, biopsy be done. In this respect, I can speak of one patient who had pulmonary tuberculosis but his laryngeal involvement proved to be malignant.

As to the treatment of early lesions. Vocal rest and the instillation of chaulmoogra oil have helped to clear up many cases. In the more advanced cases where infiltration, edema, and ulcerations are present, the galvanocautery has been of the greatest value. I have employed at this hospital the indirect method of cauterization. With a little practice, one is able to treat the lesion with as little disturbance to the patient as possible. My feeling is that, if the patient is overtaxed, more harm than good results from the treatment. It might be well to state at this point that no case is so desperately ill (unless *in extremis*) that treatment should not be instituted. It is amazing at times to note the beneficial results from a few cauterizations as regards relief of pain and improvement in swallowing. The course of the laryngeal disease does not always follow that of the pulmonary condition, and if it is possible to break up the vicious circle of painful deglutition and refusal of food, the general condition of the patient is improved and the chances of combating the pulmonary infection are enhanced.

Other methods that offer relief are orthoform instillations into the larynx. This formula, composed by Dr. Freudenthal, is particularly pleasing to some patients, and I have used it following cauterizations. Several years ago, Schugt, of New York, spoke of the beneficial value of the resection of the superior laryngeal nerve. Inasmuch as this is the sensory nerve of the larynx, resection would relieve the pain on the side resected. This procedure has been performed on about a dozen far advanced cases. It provides relief to the pain in the last weeks of illness and a more peaceful demise. Alcohol injections have been frequently used and afford relief although of temporary duration.

Recently, Dr. J. Miller, of New York, summarized the use of heliotherapy in the treatment of laryngeal cases, and emphasized the value of the carbon arc lamp. I have no doubt that its use would prove efficacious and I am hopeful that at some future date one will be installed at the hospital to supplement our other methods of treatment in laryngeal tuberculosis.

Dr. Frederick W. O'Brien of Boston read the following paper on "Natural and Artificial Light in the Treatment of Tuberculosis":

This hospital began as an institution to care for the tuberculous sick that could not be taken care of in the state sanatoria. In the early days, most of our patients were far advanced cases. Later on, provision was made for early and favorable cases to be taken care of in the several cottages and a children's infirmary was constructed. Then with the passage of state legislation requiring cities and counties to care for their tuberculous sick, earlier and more favorable cases began to come here. Now the children are sent elsewhere and in their place we are receiving bone cases. With the construction of this magnificent unit which you are visiting today, provision was made for the treatment of tuberculosis according to the standards of modern physical medicine.

In this building besides the splendid out-door solaria for the treatment with natural sunlight of selected cases of pulmonary and extrapulmonary tuberculosis there are, as you have seen, two enclosed solaria for the treatment of these conditions by artificial light. In one solarium there is a group of uviarcs and in the other a group of carbon arc lamps.

This arrangement was planned with a view to determining, if possible, the differences, if any, and the relative benefits derived from these two sources of artificial light. More than a thousand cases have been treated in these solaria to date, so that I hope to be able to offer you later something statistical as far as our experience here has taught.

The Uviarc, commonly known as the Alpine sun or mercury quartz lamp, has a limited spectrum, strong in the ultraviolet range, whereas the carbon arc in general use presents a so-called continuous

spectrum ranging from the infra-red to ultraviolet and under rather exacting conditions approximating the intensity of natural sunlight.

In the Uviarc solarium is a battery of G. E. lamps suspended from the ceiling so that patients in groups of eight in a recumbent position may be treated at one time. As the quartz globe ages, the effective radiation that passes through is decreased so that the time factor must be increased to compensate. This fact must be considered always when using this type of generator of ultraviolet light.

In the Carbon Arc Solarium is a battery of National Carbon lamps. Each lamp accommodates two pairs of carbons. The arc burns between only one pair of carbons at a time and as these burn back the arc shifts to the other pair without interruption. The four lamp unit at sixty amperes per lamp gives a like intensity of radiation over an area of about four hundred square feet or a room twenty feet square.

Panels of ultraviolet transmitting glass enclose each lamp. This glass confines the radiation from the arc to those rays found in natural sunlight. If shorter wave ultraviolet radiation is required these panels can be easily removed to permit operation with the bare arc. A practical consideration when using a carbon arc lamp is that burned out carbons have to be replaced. On the other hand, this type of lamp allows a flexibility not obtained in the uviarc, for especially cored carbons may be utilized to give one a variety of spectra for special conditions.

At the outset it should be made plain that the treatment of disease by natural and artificial light is still in the realm of controversial medicine. There is agreement that certain narrow spectral bands are specific in rickets and produce pigmentation. There are multifold reputed clinical benefits attributed to light by a host of reputable observers which it has been impossible to check and measure by modern biophysical methods.

This does not justify us however in brushing aside lightly the work of Rollier, Bernardi, Sir Henry Gauvain, LoGrasso and others. They believe that nothing compares with natural sunlight in the treatment of tuberculosis, but when this is not available artificial sources are helpful. At the same time, they give credit to the stimulating effect of moving air, salt sea baths, rest, helpful surroundings and proper food, in their end results.

If you wish to appreciate the difficulties of evaluating the benefits ascribed to natural and artificial sunlight in the treatment of disease you have but to refer to the recent survey of the subject by Edgar Mayer. You will then appreciate that the problem is not so simple as the itinerant salesman would have you believe.

It is said that natural and artificial sunlight favorably affect metabolism, growth, and the peripheral blood. There is general recognition of the specificity in rickets of ultraviolet radiation (3020 to 3130 A) as found in natural and artificial sunlight.

Phelps states that the spectral region from 3200 to 3800 A is probably specific for surgical tuberculosis. This is not universally held. Natural sunlight and the continuous spectrum of the carbon arc contain these wave-lengths. They are not found in the mercury vapor arc in sufficient intensity to be of practical application.

Miles and Laurens have shown a definite stimulation of the hematopoietic system with an increase in the red cells following carbon arc irradiation. Their more recent work in secondary anemia artificially produced in dogs has not fulfilled the hope of many that heliotherapy perhaps might be directly concerned in the production of hemoglobin. They state however that carbon arc irradiation prepares the stroma for the production of hemoglobin. Hoeffel concluded that sunlight had no effect whatever on the blood.

Solar light and artificial sunlight produce heat which is quickly convected by the blood stream. The most penetrating radiation of the spectral regions of which I am speaking is absorbed within a millimeter of tissue. It is most likely that any systemic benefit derived from phototherapy is an indirect one.

A word about pigmentation. Pigment may be produced by many intense sources of heat. Pigmentation is no criterion that a patient will do well. Patients who fail to develop pigment respond favorably to treatment just as patients who develop strong pigment often fail to heal.

Ultraviolet radiation between 2600 and 2700 angstrom units is bactericidal. These wave lengths are not ordinarily found in sunlight or in the carbon arc sunlight spectrum. They are produced in the quartz mercury vapor lamp.

In explanation of the lack of agreement between the practical therapeutic results and the scientific experimental observations, your attention is drawn to the fact that the experiments were done for the most part on healthy men and animals, whereas usually the practical results have been obtained in the sick. Then, too, the animal skin is not perhaps comparable to that in man.

These differences are called to your notice not to confuse but to show you that the problem is a complex one.

Having seen the installations made here in an attempt to obtain scientific as well as practical results one may well doubt the value of many office installations. This is especially applicable to certain carbon arc lamps and ultraviolet generators recommended for the home, and applies with even greater force to the recently developed dual lighting system for illumination as well as general health effect. There is no evidence that the normal individual does not get enough sunshine in our latitude. Enthusiastic authors, especially of advertising copy, omit entirely any estimate of sky shine which is rich in ultraviolet.

The types of cases to be treated in this hospital are selected by the members of the medical and surgical staff. My department has the direction of dosage. Up to now it has been an empirical problem based on the erythema production time and the general reaction of the patient. Our patients are subjected to artificial light by measured gradations after the manner employed by Rollier dealing with natural sunlight.

The following well-established physical and biologic reactions to light must always be considered when estimating dosage:

The amount of exposure to light needed decreases as the intensity is increased.

The product of intensity and the length of exposure is a constant.

The phototrophic response occurs only when the amount of the photochemical product produced reaches a certain minimal value.

The stimulative effect of illumination may be received by one portion of the body and transmitted to another.

Only a very small amount of photochemical product is required to initiate the physiological events through which a modification is brought about.

Deficiency in the amount of light results in a delayed or complete failure of tissue differentiation. Exposure to an excess of light may result in the premature differentiation.

Since this paper was scheduled for presentation Coblentz has offered a quantity unit for measuring light which if found constant should solve the dosage problem. He suggests a radiant flux of ten microwatts, 100 ergs per square centimeter per second of homogeneous radiation of the wave length 2967 A be called the Finsen unit FU.

This unit may be applied for sources differing widely in spectral qualities and a total intensity of ultraviolet radiation useful for therapeutic purposes. Most of the public data now available are inconsistent and misleading, Coblentz says, because these data do not include a factor that equates the physiologic erythema response. Using his unit, this factor is taken into consideration and there is good agreement between the observed and the computed time of exposure to produce a minimum perceptible erythema.

A MEETING OF THE NEW ENGLAND HEALTH EDUCATORS

The seventh annual meeting of the New England Health Education Association formerly known as the Health Education Council was held June 3 and 4 at the Pratt Naval Architecture building, Massachusetts Institute of Technology. The meeting was presided over by Dr. C. E. Turner, professor of biology and public health at the Massachusetts Institute of Technology, and the members were welcomed by Dr. Karl T. Compton, president of the institution.

NEW ENGLAND HOSPITAL FOR WOMEN AND CHILDREN

The regular clinical conference of the New England Hospital for Women and Children will be held on Thursday, June 16, at 8 P.M., at the hospital, Dimock Street, Roxbury. The following cases will be reported: Myxosarcoma of the liver in a boy of 6; Septicemia following curettage. Dr. Nute will speak on "The Importance of the Buried Tonsil to the General Practitioner." The conferences will be resumed on the third Thursday in September.

ALICE H. BIGELOW, M.D., *Secretary.*

SOCIETY MEETINGS
CONGRESSES AND CONFERENCES

June 8, 9, 10—Massachusetts Medical Society, Hotel Statler, Boston.

June 9—Harvard Medical School Alumni Association. See notice on page 1171, issue of June 2.

June 14—South End Medical Club. See notice on page 1171, issue of June 2.

June 16—New England Hospital for Women and Children. See notice above.

June 21-24—Catholic Hospital Association. See page 369, issue of February 18.

July 10 - August 12—The Second Intensive European Summer Course in Surgery, Gynecology and Obstetrics. See page 714, issue of March 31.

Autumn—International Postgraduate Courses in Berlin. See page 1169, issue of December 10.

September 19-22 — International Congress of Biliary Lithiasis. See notice on page 427, issue of February 25.

October 24-27 — American Public Health Association. See notice on page 1321, issue of December 31.

October 24-28—Inter-state Postgraduate Medical Association of North America. See page 39, issue of January 7.

BOOK REVIEW

Matas Birthday Volume—A Collection of Surgical Essays Written in Honor of Rudolph Matas. New Orleans. Paul B. Hoeber, Inc. New York, 1931. Price $10.00.

This volume is a reprint from the *American Journal of Surgery* of a collection of surgical papers in honor of Professor Rudolph Matas. The essays are by men who have written extensively in the field of surgery and are authorities on the subjects which they discuss. The surgery of the vascular system, a field with which the name of Dr. Matas is particularly associated, is well discussed by René Leriche, Roberto Alessandri, Mont Reid and Hubert A. Royster. Other noteworthy articles are those of Robert C. Coffee on Cancer of the Rectum and Rectosigmoid; John B. Deaver on Cancer of the Breast, and Splenectomy by D. P. D. Wilkie of Edinburgh. Drs. George Crile, William J. Mayo and Joseph C. Bloodgood have contributed articles of more general or historical interest. The book is beautifully printed and contains a photograph of Dr. Matas as a frontispiece.